FORM PTO-1390 (Modified) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE (REV 11-2000)	ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES	**210375US2PCT**
DESIGNATED/ELECTED OFFICE (DO/EO/US)	U.S. APPLICATION NO. IF KNOWN, SEE 37 CFR
CONCERNING A FILING UNDER 35 U.S.C. 371	**09/869295**

INTERNATIONAL APPLICATION NO. **PCT/GB00/00114**	INTERNATIONAL FILING DATE **18 January 2000**	PRIORITY DATE CLAIMED **18 January 1999**

TITLE OF INVENTION
APPARATUS AND METHOD FOR ROUTING COMMUNICATIONS

APPLICANT(S) FOR DO/EO/US
DE BEER Leon

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
    a. ☐ is attached hereto (required only if not communicated by the International Bureau).
    b. ☒ has been communicated by the International Bureau.
    c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
    a. ☐ is attached hereto.
    b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)).
    a. ☐ are attached hereto (required only if not communicated by the International Bureau).
    b. ☐ have been communicated by the International Bureau.
    c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
    d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

    Notice for Consideration of Documents Cited in International Search Report
    Notice of Priority
    PCT/IB/304
    PCT/IB/308

24. The following fees are submitted:.				

U.S. APPLICATION NO. (IF KNOWN), SEE 37 CFR	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/869295	PCT/GB00/00114	210375US2PCT

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

			CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 GFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	$1000.00	
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	$860.00	
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$710.00	
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$690.00	
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	$100.00	

ENTER APPROPRIATE BASIC FEE AMOUNT =	$860.00	

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	$0.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	89 - 20 =	69	x $18.00	$1,242.00	
Independent claims	5 - 3 =	2	x $80.00	$160.00	
Multiple Dependent Claims (check if applicable).			☐	$0.00	

TOTAL OF ABOVE CALCULATIONS =	$2,262.00	

☐ Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.	$0.00	

SUBTOTAL =	$2,262.00	

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +	$0.00	

TOTAL NATIONAL FEE =	$2,262.00	

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐	$0.00	

TOTAL FEES ENCLOSED =	$2,262.00	

Amount to be: refunded	$
charged	$

a. ☒ A check in the amount of ___$2,262.00___ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. ___15-0030___ A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Surinder Sachar

SIGNATURE

Marvin J. Spivak

NAME

24,913

REGISTRATION NUMBER

July 18 2001

DATE

22850

Surinder Sachar
Registration No. 34,423

DOCKET NO.   210375US2PCT

IN RE APPLICATION OF: DE BEER Leon

09/869295

SERIAL NO.:   New U.S. PCT Application (Based on PCT/GB00/00114)

FILED: 18 January 2000

FOR: APPARATUS AND METHOD FOR ROUTING COMMUNICATIONS

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified application.

☐   No additional fee is required.

☐   Small entity status of this application under 37 C.F.R. §1.9 and §1.27 has been established by a verified
statement previously submitted.

☐   Small entity status of this application under 37 C.F.R. §1.9 and §1.27 has been established by a verified
statement submitted herewith.

☒   Additional documents filed herewith: PCT Transmittal Letter/Notice of Priority
Request for Consideration/PCT/IB/304/Declaration/PCT/IB/308/Preliminary Amendment
International Search Report/International Preliminary Examination Report/Check for $2,262.00

The fee has been calculated as shown below.

	CLAIMS REMAINING AFTER		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	SMALL ENTITY		OTHER THAN A SMALL ENTITY	
					RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE
TOTAL	* 89	MINUS	** 89	=	X9 =	$	X18 =	$0.00
INDEP	* 5	MINUS	*** 5	=	X40 =	$	X80 =	$0.00
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+135=	$	+270=	$0.00
					TOTAL	$	TOTAL	$0.00

___   A check in the amount of $_____ is attached.

XX   Please charge any additional fees for the papers being filed herewith and for which no check is enclosed herewith, or credit any
overpayment to deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.

XX   If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R.
§1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time may be charged to deposit
Account No. 15-0030. A duplicate copy of this sheet is enclosed.

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

[signature]

Marvin J. Spivak
Attorney of Record
Registration No. 24,913
Surinder Sachar
Registration No. 34,423

22850

(703) 413-3000

*If the entry in Column 2 is less than the entry in Column 1 write "0" in Column 3.
**If the "Highest Number Previously paid for" IN THIS SPACE is less than 20 write "20" in this space.
***If the "Highest Number Previously paid for" IN THIS SPACE is less than 3 write "3" in this space.7/93

210375US-3198-10303-2-PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

LEON DE BEER   : ATTN: APPLICATION DIVISION

SERIAL NO: NEW U.S. PCT APPLN   :
  (Based on PCT/GB00/00114)

FILED: HEREWITH   : EXAMINER:

FOR: APPARATUS AND METHOD FOR:
      ROUTING COMMUNICATIONS

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Prior to a first examination on the merits, please amend the above-identified

application as follows:

IN THE CLAIMS

Please amend the claims as follows:

4. (Amended) A method as claimed in claim 2 wherein the decision is based at least

in part on performance of at least one network selected in accordance with the preferred route.

5. (Amended) A method as claimed in claim 1 wherein the preferred route codes

further determine a choice of a further network (5A,5B,5C) for forward connection between a

network (8A) of the service provider of the selected communication channel and the call

destination (2) via the further network.

7. (Amended) A method as claimed in claim 5 wherein the mobile telephone adds a prefix code (50) to the user generated call destination information.

9. (Amended) A method as claimed in claim 7 wherein the prefix code includes a charging information field (51) for identifying a control entity (7) to be billed by one or more service providers corresponding to the selected network connection route.

10. (Amended) A method as claimed in claim 1 including the step of the mobile telephone periodically scanning (62) received transmissions to identify available communications channels (80,81,82,83) and completing (63) a registration procedure for all available channels in order to facilitate subsequent communication by selection therefrom.

12. (Amended) A method as claimed in claim 10 including the step of electing (65) from the available channels an update receiving channel (80) for receipt of updating information broadcasts.

13. (Amended) A method as claimed in claim 1 wherein the look-up table (1000) is stored in a portable storage medium (505) removably installed in the mobile telephone.

15. (Amended) A method as claimed in claim 13 wherein the portable storage medium is a SIM (subscriber identity module) card (505) which also stores subscriber specific data for identification and authentication purposes.

16. (Amended) A method as claimed in claim 13 wherein the look-up table is populated with an initial set of data before installation of the storage medium in the mobile telephone.

17. (Amended) A method as claimed in claim 1 including the step of periodically updating the data stored in the look-up table by receiving data blocks each containing a respective portion of updated data and, for each received data block, overwriting a corresponding portion of the existing data with updated data from the received block.

18. (Amended) A method as claimed in claim 1 wherein the look-up table (900) comprises:

a routing table (1101) containing the preferred route codes;

a carrier selection table (1102) containing, for each preferred route code, a list in order of priority of carrier selections to be used, subject to availability; and

a carrier access table (1103) containing, for each carrier selection, a channel selection identifying a communications channel provided by a service provider of the mobile telephone system and a prefix code to be added to the dialled number identifying a further network for routing the call.

23. (Amended) A method as claimed in claim 1 wherein the look-up table comprises default route data and wherein if accessing the look-up table with the call destination information fails to locate corresponding data defining a preferred route code, the preferred route code is derived from the default route data.

24. (Amended) A method as claimed in claim 1 wherein updating information for updating the look-up table is communicated to the mobile telephone via a selected one of the available communications channels.

26. (Amended) A method as claimed in claim 24 wherein the updating information is transmitted as a multipoint broadcast to a plurality of mobile telephones.

27. (Amended) A method as claimed in claim 1 wherein the updating information is transmitted to the mobile telephone as a web page.

29. (Amended) A method as claimed in claim 27 wherein the mobile telephone processes the web page to extract updating information; stores the extracted updating information in a buffer memory; and updates the look-up table with updating information read from the buffer memory.

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30. (Amended) A method as claimed in claim 1 wherein the updating information is communicated to the mobile telephone by detachably connecting the mobile telephone to a docking station (1300,1500) and transmitting the updating information to the mobile telephone via the docking station.

34. (Amended) A method as claimed in claim 31 wherein the broadcasting network is an optical cable network (1301).

35. (Amended) A method as claimed in claim 31 wherein the broadcasting network is a satellite television network.

39. (Amended) A method as claimed in claim 30 wherein the mobile telephone comprises an internal battery (1400) which is recharged by detachably connecting the mobile telephone to the docking station.

40. (Amended) A method as claimed in claim 1 wherein the preferred route code determines a route via a packet switched network (1800) and comprises network address information defining at least one node (1801) of the network which is to be included in the selected route.

42. (Amended) A method as claimed in claim 40 wherein the outgoing telephone call is transmitted as a packetised signal using a protocol in which such signals include a start address indicator interpreted by the network as being representative of a network address from which the call originates and comprising the further step of transmitting the outgoing telephone call including start address information (1902) defined by the preferred route code.

44. (Amended) A method as claimed in claim 1 wherein the telephone call is originated to communicate data comprising a type of data selected from a set of alternative types of data.

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46. (Amended) A method as claimed in claim 43 wherein the look-up table stores respective preferred route codes for each of the types of data.

47. (Amended) A method as claimed in claim 1 wherein the cellular telephone system comprises part of a packet switching network in which the mobile telephone constitutes a node of the network and wherein the call destination constitutes a further node of the network.

51. (Amended) A mobile telephone as claimed in claim 49 wherein the prefix code includes a charging information field (51) for identifying a control entity (7) to be billed by one or more service providers corresponding to the selected network connection route.

52. (Amended) A mobile telephone as claimed in claim 48 comprising means (300) for periodically scanning received transmissions to identify available communications channels (80,81,82,83) and completing a registration procedure for all available channels in order to facilitate subsequent communication by selection therefrom.

55. (Amended) A mobile telephone as claimed in claim 48 wherein the look-up table (1000) is stored in a portable storage medium (505) removably installed in the mobile telephone.

57. (Amended) A mobile telephone as claimed in claim 55 wherein the portable storage medium is a SIM (subscriber identity module) card (505) which also stores subscriber specific data for identification and authentication purposes.

58. (Amended) A mobile telephone as claimed in claim 48 comprising updating means (901,136) for periodically updating the data stored in the look-up table by receiving data blocks each containing a respective portion of updated data and, for each received data block, overwriting a corresponding portion of the existing data with updated data from the received block.

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59. (Amended) A mobile telephone as claimed in claim 48 wherein the look-up table (900) comprises:

a routing table (1101) containing the preferred route codes;

a carrier selection table (1102) containing, for each preferred route code, a list in order of priority of carrier selections to be used, subject to availability; and

a carrier access table (1103) containing, for each carrier selection, a channel selection identifying a communications channel provided by a service provider of the mobile telephone system and a prefix code to be added to the dialled number identifying a further network for routing the call.

64. (Amended) A mobile telephone as claimed in claim 1 wherein the look-up table comprises default route data (1105) and wherein the accessing means is operable, if accessing the look-up table with the call destination information fails to locate corresponding data defining a preferred route code, to derive preferred route code from the default route data.

65. (Amended) A mobile telephone as claimed in claim 48 comprising means (901) for extracting updating information for updating the look-up table from signals communicated to the mobile telephone via a selected one of the available communications channels.

69. (Amended) A mobile telephone as claimed in claim 67 wherein the extracting means comprises a processor operable to process the web page to extract updating information; store the extracted updating information in a buffer memory (902); and update the look-up table with updating information read from the buffer memory.

70. (Amended) A mobile telephone as claimed in claim 48 comprising connecting means (1302) operable to detachably connect the mobile telephone to a docking station (1300,1500) and an interface (1406) for receiving the updating information transmitted in use to the mobile telephone via the docking station.

72. (Amended) A mobile telephone as claimed in claim 48 wherein the preferred route code determines a route via a packet switched network (1800) and comprises network address information defining in use at least one node (1801) of the network which is to be included in the selected route.

74. (Amended) A mobile telephone as claimed in claim 72 comprising means for transmitting the outgoing telephone call as a packetised signal using a protocol in which such signals include a start address indicator interpreted in use by the network as being representative of a network address from which the call originates and wherein the transmitting means is operable to transmit the outgoing telephone call including start address information (1902) defined by the preferred route code.

75. (Amended) A mobile telephone as claimed in claim 48 and operable to output communications signals representative of a type of data selected from a set of alternative types of data.

77. (Amended) A mobile telephone as claimed in claim 75 wherein the look-table stores respective preferred route codes for each of the types of data.

85. (Amended) A computer program comprising processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in claim 1.

86. (Amended) A storage medium storing processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in claim 1.

87. (Amended) A communications signal comprising processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in claim 1.

88. (Amended) A communications signal comprising route selecting information contained in an outgoing telephone call signal in accordance with a method as claimed in claim 1.

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Please add the following new Abstract on a separate sheet:

ABSTRACT OF THE DISCLOSURE

A mobile telephone is provided with a look-up table enabling the mobile telephone to select preferred routes for connecting outgoing calls on the basis of predetermined codes which populate the look-up table. When operating in a cellular communications network a communications channel may thereby be selected from a plurality of available channels and ongoing transmission of an outgoing call may be routed via a further network selected in accordance with the route codes. The look-up table may be stored in a SIM card of the mobile telephone and may be updated via transmission of data from a remote control center via a cellular network or via a docking station to which the mobile telephone is releasably connectable. When the call is routed via a packet switching network, the routing code may include a string of network node addresses.

REMARKS

Favorable consideration of this application, as presently amended, is respectfully requested.

The present preliminary amendment is submitted to place the above-identified application in more proper format under United States practice. By the present preliminary amendment the claims have been amended to no longer recite any improper multiple dependencies. A new Abstract is also submitted herein.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is hereby respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, P.C.

Gregory J. Maier
Attorney of Record
Registration No. 25,599
Surinder Sachar
Registration No. 34,423

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IN THE CLAIMS

--4. (Amended) A method as claimed in [any of] claim[s] 2 [and 3] wherein the decision is based at least in part on performance of at least one network selected in accordance with the preferred route.

5. (Amended) A method as claimed in [any preceding] claim 1 wherein the preferred route codes further determine a choice of a further network (5A,5B,5C) for forward connection between a network (8A) of the service provider of the selected communication channel and the call destination (2) via the further network.

7. (Amended) A method as claimed in [any of] claim[s] 5 [and 6] wherein the mobile telephone adds a prefix code (50) to the user generated call destination information.

9. (Amended) A method as claimed in [any of] claim[s] 7 [and 8] wherein the prefix code includes a charging information field (51) for identifying a control entity (7) to be billed by one or more service providers corresponding to the selected network connection route.

10. (Amended) A method as claimed in [any preceding] claim 1 including the step of the mobile telephone periodically scanning (62) received transmissions to identify available communications channels (80,81,82,83) and completing (63) a registration procedure for all available channels in order to facilitate subsequent communication by selection therefrom.

12. (Amended) A method as claimed in [any of] claim[s] 10 [and 11] including the step of electing (65) from the available channels an update receiving channel (80) for receipt of updating information broadcasts.

13. (Amended) A method as claimed in [any preceding] claim 1 wherein the look-up table (1000) is stored in a portable storage medium (505) removably installed in the mobile telephone.

15. (Amended) A method as claimed in [any of] claim[s] 13 [and 14] wherein the portable storage medium is a SIM (subscriber identity module) card (505) which also stores subscriber specific data for identification and authentication purposes.

16. (Amended) A method as claimed in [any of] claim[s] 13 [to 15] wherein the look-up table is populated with an initial set of data before installation of the storage medium in the mobile telephone.

17. (Amended) A method as claimed in [any preceding] claim 1 including the step of periodically updating the data stored in the look-up table by receiving data blocks each containing a respective portion of updated data and, for each received data block, overwriting a corresponding portion of the existing data with updated data from the received block.

18. (Amended) A method as claimed in [any preceding] claim 1 wherein the look-up table (900) comprises:

a routing table (1101) containing the preferred route codes;

a carrier selection table (1102) containing, for each preferred route code, a list in order of priority of carrier selections to be used, subject to availability; and

a carrier access table (1103) containing, for each carrier selection, a channel selection identifying a communications channel provided by a service provider of the mobile telephone

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system and a prefix code to be added to the dialled number identifying a further network for routing the call.

23. (Amended) A method as claimed in [any preceding] claim 1 wherein the look-up table comprises default route data and wherein if accessing the look-up table with the call destination information fails to locate corresponding data defining a preferred route code, the preferred route code is derived from the default route data.

24. (Amended) A method as claimed in [any preceding] claim 1 wherein updating information for updating the look-up table is communicated to the mobile telephone via a selected one of the available communications channels.

26. (Amended) A method as claimed in [any of] claim[s] 24 [and 25] wherein the updating information is transmitted as a multipoint broadcast to a plurality of mobile telephones.

27. (Amended) A method as claimed in [any of] claim[s] 1 [to 26] wherein the updating information is transmitted to the mobile telephone as a web page.

29. (Amended) A method as claimed in [any of] claim[s] 27 [and 28] wherein the mobile telephone processes the web page to extract updating information; stores the extracted updating information in a buffer memory; and updates the look-up table with updating information read from the buffer memory.

30. (Amended) A method as claimed in [any of] claim[s] 1 [to 23] wherein the updating information is communicated to the mobile telephone by detachably connecting the mobile telephone to a docking station (1300,1500) and transmitting the updating information to the mobile telephone via the docking station.

34. (Amended) A method as claimed in [any of] claim[s] 31 [to 33] wherein the broadcasting network is an optical cable network (1301).

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35. (Amended) A method as claimed in [any of] claim[s] 31 [to 33] wherein the broadcasting network is a satellite television network.

39. (Amended) A method as claimed in [any of] claim[s] 30 [to 38] wherein the mobile telephone comprises an internal battery (1400) which is recharged by detachably connecting the mobile telephone to the docking station.

40. (Amended) A method as claimed in [any preceding] claim 1 wherein the preferred route code determines a route via a packet switched network (1800) and comprises network address information defining at least one node (1801) of the network which is to be included in the selected route.

42. (Amended) A method as claimed in [any of] claim[s] 40 [and 41] wherein the outgoing telephone call is transmitted as a packetised signal using a protocol in which such signals include a start address indicator interpreted by the network as being representative of a network address from which the call originates and comprising the further step of transmitting the outgoing telephone call including start address information (1902) defined by the preferred route code.

44. (Amended) A method as claimed in [any preceding] claim 1 wherein the telephone call is originated to communicate data comprising a type of data selected from a set of alternative types of data.

46. (Amended) A method as claimed in [any of] claim[s] 43 [and 44] wherein the look-up table stores respective preferred route codes for each of the types of data.

47. (Amended) A method as claimed in [any preceding] claim 1 wherein the cellular telephone system comprises part of a packet switching network in which the mobile telephone constitutes a node of the network and wherein the call destination constitutes a further node of the network.

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51. (Amended) A mobile telephone as claimed in [any of] claim[s] 49 [and 50] wherein the prefix code includes a charging information field (51) for identifying a control entity (7) to be billed by one or more service providers corresponding to the selected network connection route.

52. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 51] comprising means (300) for periodically scanning received transmissions to identify available communications channels (80,81,82,83) and completing a registration procedure for all available channels in order to facilitate subsequent communication by selection therefrom.

55. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 54] wherein the look-up table (1000) is stored in a portable storage medium (505) removably installed in the mobile telephone.

57. (Amended) A mobile telephone as claimed in [any of] claim[s] 55 [and 56] wherein the portable storage medium is a SIM (subscriber identity module) card (505) which also stores subscriber specific data for identification and authentication purposes.

58. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 57] comprising updating means (901,136) for periodically updating the data stored in the look-up table by receiving data blocks each containing a respective portion of updated data and, for each received data block, overwriting a corresponding portion of the existing data with updated data from the received block.

59. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 58] wherein the look-up table (900) comprises:

a routing table (1101) containing the preferred route codes;

a carrier selection table (1102) containing, for each preferred route code, a list in order of priority of carrier selections to be used, subject to availability; and

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a carrier access table (1103) containing, for each carrier selection, a channel selection identifying a communications channel provided by a service provider of the mobile telephone system and a prefix code to be added to the dialled number identifying a further network for routing the call.

64. (Amended) A mobile telephone as claimed in [any preceding] claim 1 wherein the look-up table comprises default route data (1105) and wherein the accessing means is operable, if accessing the look-up table with the call destination information fails to locate corresponding data defining a preferred route code, to derive preferred route code from the default route data.

65. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 64] comprising means (901) for extracting updating information for updating the look-up table from signals communicated to the mobile telephone via a selected one of the available communications channels.

69. (Amended) A mobile telephone as claimed in [any of] claim[s] 67 [and 68] wherein the extracting means comprises a processor operable to process the web page to extract updating information; store the extracted updating information in a buffer memory (902); and update the look-up table with updating information read from the buffer memory.

70. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 64] comprising connecting means (1302) operable to detachably connect the mobile telephone to a docking station (1300,1500) and an interface (1406) for receiving the updating information transmitted in use to the mobile telephone via the docking station.

72. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 71] wherein the preferred route code determines a route via a packet switched network (1800) and

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comprises network address information defining in use at least one node (1801) of the network which is to be included in the selected route.

74. (Amended) A mobile telephone as claimed in [any of] claim[s] 72 [and 73] comprising means for transmitting the outgoing telephone call as a packetised signal using a protocol in which such signals include a start address indicator interpreted in use by the network as being representative of a network address from which the call originates and wherein the transmitting means is operable to transmit the outgoing telephone call including start address information (1902) defined by the preferred route code.

75. (Amended) A mobile telephone as claimed in [any of] claim[s] 48 [to 74] and operable to output communications signals representative of a type of data selected from a set of alternative types of data.

77. (Amended) A mobile telephone as claimed in [any of] claim[s] 75 [and 76] wherein the look-table stores respective preferred route codes for each of the types of data.

85. (Amended) A computer program comprising processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in [any of] claim[s] 1 [to 47].

86. (Amended) A storage medium storing processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in [any of] claim[s] 1 [to 47].

87. (Amended) A communications signal comprising processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in [any of] claim[s] 1 [to 47].

88. (Amended) A communications signal comprising route selecting information contained in an outgoing telephone call signal in accordance with a method as claimed in [any of] claim[s] 1 [to 47].--

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APPARATUS AND METHOD FOR ROUTING COMMUNICATIONS

The present invention relates to an apparatus and method for telephone communication from mobile cellular telephones and is particularly concerned with an

5   apparatus and method for routing communication to a call destination along a preferential route.

In recent years many countries have liberalised their telecommunications systems. As a result, when a user

10   operates a telephone, the user increasingly has a choice as to the networks used to carry his message. Each network has typically a different set of characteristics such as geographical extent, speed of transmission, and an associated cost.

15

Devices are known which automatically route messages along the route of least cost for use with fixed (land line) telephone apparatus. As the route costings of the networks change, the routing information stored in these

20   devices needs to be updated as the least cost route may have changed. This updating is done by sending updated information along the telephone lines to the least cost route device.

25   The present invention seeks to provide improved facilities for users of mobile cellular telephones. At present, it is normal for such users of mobile cellular telephones to have the facility to register with only a single service provider, with optionally a roaming

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facility which allows one or more additional service
providers to be used from the same mobile telephone. The
user however is left to make his own decision as to which
service provider to use for a particular call and is
5   required to manually select the service provider and
hence the communication channel required for the call.

Further liberalisation of telecommunications systems is
anticipated to allow total flexibility in the choice of
10   routing of calls from a mobile telephone, both in terms
of the service provider selected for communicating the
call as far as a gateway to the public service telephone
network and also in the subsequent choice of network
connection within the public service telephone network
15   for finally routing the call to the call destination. It
is further anticipated that mobile virtual network
operators may provide services to users of the system via
commercial agreements with the actual operators of the
cellular networks.

20

According to the present invention there is disclosed a
method of operating a mobile telephone in a cellular
telephone communications system in which a plurality of
service providers provide respective alternative
25   communications channels comprising the steps of;

storing routing information in a look-up table of
the mobile telephone such that the table is populated
with data in the form of preferred route codes, each
preferred route code being representative of a preferred

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route for connection to a respective call destination;

originating an outgoing telephone call by the input
of user generated call destination information;

accessing the look-up table using an address
5   determined at least in part by the call destination
information to obtain a selected preferred route code;

selecting one of the communication channels in
accordance with the preferred route code; and

establishing communication for the outgoing
10   telephone call for a call destination corresponding to
the call destination information via the selected
communication channel of a corresponding selected service
provider.

15   Preferably the look-up table is populated with the
results of a route selection decision made by a remote
control centre, thereby minimising the processing
required by the telephone by arriving at the optimum
selection of route. The data in the look-up table is
20   preferably periodically refreshed by updating information
which may be communicated to the mobile telephone via the
cellular telephone communications system or via a docking
station to which the mobile telephone is releasably
connectable.

25

The look-up table in a preferred embodiment is stored in
a smart card which also constitutes the SIM card of the
mobile telephone and a SIM card containing an initial
version of the look-up table may be prepared prior to

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installation in a mobile telephone.

Further aspects of the present invention are disclosed in
the appended claims.

5

Preferred embodiments of the present invention will now
be described by way of example only and with reference to
the accompanying drawings of which;

10   Figure 1 is a schematic representation of a mobile
telephone connected to telephone networks via any one of
a plurality of cellular phone service providers;

Figure 2 is a schematic representation of the functional
15   elements of the mobile telephone of Figure 1;

Figure 3 is a schematic representation of the functional
elements of the mobile telephone of Figure 1 showing
detail of the selection of look-up table information;

20

Figure 4 is a schematic diagram of the telephone number
including prefix code added by the routing means;

Figure 5 is a schematic diagram of a further embodiment
25   of a telephone operated under software control by a
processor;

Figure 6 is a flow chart illustrating operation of the
telephone of Figure 5;

5

Figure 7 is a flow chart illustrating the process of initiating an outgoing call;

Figure 8 is a schematic diagram showing available channels for use by a mobile telephone;

Figure 9 is a schematic representation of an alternative mobile telephone having a single look-up table;

Figure 10 is a schematic diagram of a further mobile telephone having a routing table stored in a SIM card;

Figure 11 is a schematic diagram illustrating the structure of the look-up table of Figure 10;

Figure 12 is a flow chart illustrating use of the look-up table of Figure 11;

Figure 13 is a schematic diagram of a further alternative mobile telephone having a docking station for receiving updating data from a cable network;

Figure 14 is a schematic diagram illustrating circuit details of the mobile telephone of Figure 13;

Figure 15 is a schematic diagram of a further alternative mobile telephone having a docking station for land line telephone updating of the look-up table;

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Figure 16 is a schematic circuit diagram of the mobile telephone and docking station of Figure 15;

Figure 17 is a schematic diagram of a further alternative mobile telephone having a docking station for land line telephone updating of the look-up table and in which the docking station includes a modem;

Figure 18 is a schematic diagram of a further embodiment in which routing is effected via a packet switched network;

Figure 19 is a schematic diagram of a prefix code embedded in packetised data;

Figure 20 is a schematic diagram illustrating routing of a call via the Internet and the updating of the look-up table using web pages;

Figure 21 illustrates schematically the routing of a call via a network system formed as an integrated packet switch network; and

Figure 22 illustrates schematically the manner in which program code in input tot he mobile telephone in accordance with the present invention and the manner in which a SIM card is provided with a look-up table prior to installation in the mobile telephone.

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Figure 1 illustrates schematically the manner in which a
mobile telephone 1 is able to make a telephone call to a
destination telephone 2 which in this example is
connected via land lines to a local exchange 6A. The
5   local exchange 6A is accessible via any one of a number
of interconnected conventional (land line) telephone
networks 5A, 5B, 5C operated by respective network
operators.

10   Figure 1 illustrates base stations 4A, 4B and 4C of
respective cellular mobile telephone networks 8A, 8B and
8C each connected to the conventional telephone networks
5A, 5B and 5C, the base stations being arranged to
provide cellular communications over an air interface 9
15   with mobile telephones in cells local to each base
station. In some instances, base stations 4A, 4B, 4C may
be physically shared by the mobile telephone networks 8A,
8B, 8C but for the purpose of the present explanation
these are represented as distinct base stations at
20   different locations in Figure 1.

Wireless telemetry communication between the mobile
telephone 1 and the cellular telephone service provider
base stations 4A, 4B, 4C conforms to conventional
25   protocols in which distinct sets of frequencies are made
available to the different service providers.

Each cell of the cellular telephone system will typically
define a geographical area within which mobile telephones

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can operate on any one of a number of frequencies depending upon the selected service provider and the relative reception characteristics of frequencies used by that service provider within the cell. For a given

5   frequency, multiple users are accommodated using data packet multiplexing of digital data. For the purposes of the present description, the term "channel" will be used to refer to the communication facilities provided by a single service provider so that each of the service

10   providers makes available a respective channel for multiple users. Selection of a channel in the present context is therefore equivalent of selection of a mobile telephone network or service provider from a number of available options operating in parallel.

15

The mobile telephone 1 of the present invention is provided with a least cost routing means 3 enabling the mobile telephone to select, without user intervention, a preferred route for connection to the telephone 2 based

20   on the input by the user of the call destination telephone number. The mobile telephone 1 determines the preferred route with reference to routing information stored in the mobile telephone 1, the selection being made on the basis of call destination and other

25   parameters such as time and calendar data.

A selection of the preferred route firstly entails selection of which of the mobile telephone networks should receive the outgoing call from the telephone 1.

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For many calls, particularly to destination telephones which themselves are mobile telephones (not shown in Figure 1), this choice of service provider will uniquely determine the forward routing of the connection to the destination telephone. In other instances, there will remain a number of available options for forward connection from the mobile telephone network 8A of a given service provider to the telephone 2, for example via any one of the (land line) networks 5A, 5B and 5C. The selected route will therefore need to also define in these instances the preferred (land line) network and this is accomplished by additionally prefixing the telephone number dialled by the user with a prefix code stored in memory within the mobile telephone 1.

The mobile telephone networks 8A, 8B, 8C include switching centres which provide a gateway for connection to the land line networks 5A, 5B, 5C and, for calls directed through the gateway, determine routing in accordance with the prefix code.

A control centre 7 is also connected to the telephone networks and is therefore in communication with both the networks 5A, 5B, 5C and the cellular mobile telephone networks 8A, 8B, 8C. The control centre 7 will typically be administered by an entity which is independent of the mobile telephone networks 8A, 8B, 8C and the land line networks 5 and may for example be a virtual network operator.

10

In the following description of preferred embodiments, reference is made to a least cost routing means (LCRM) 3. Such LCRM is to be understood to be an example of a routing device in accordance with the present invention and that, although the predetermined information on which the routing device operates will typically be decided on the basis of least cost routing, the information may equally well be determined on the basis of network availability, level of use of networks, or other factors, or a combination of the above which may be appropriate to particular operating circumstances. It is important to note that the least cost routing means is notionally unaware of the basis on which the routing decision is determined, this decision being conducted remotely therefrom by the control centre 7 and the results of the decisions for each parameter such as call destination being made available in the form of a look-up table.

The cellular telephone service providers and the operators of networks 5A, 5B, 5C send billing information containing details of the caller's telephone number, the called telephone number and the duration of the call, to the control centre 7. The control centre 7 subsequently bills the caller. In this way, rather than receiving separate bills from each of service providers and the operators of the networks 5A, 5B, 5C for each accounting period, a caller receives one bill from the control centre 7 for those calls processed by the control centre. (It is envisaged that some calls may still need to be

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billed directly by the network to which the user
subscribes.) The operator of the control centre 7 pays
each service provider and network operator for the time
used on its respective network. Such networks may be
5   public or private data networks and may include the
Internet. Such networks may therefore include data
networks not originally or primarily intended for
carrying voice traffic.

10   The control centre 7 collates costing information to
determine the current rates charged by the cellular
telephone service providers and network operators for
communicating between any two telephones 1, 2 and the
least cost route is calculated by the control centre 7
15   for given time periods. Typically service providers and
network operators charge at different rates for different
times of the day, there being typically a peak charge
time period and an off peak time period, these rates also
typically differing according to the day of week.
20   Whenever a change in the cost of using a cellular service
or network occurs, the comparison by the control centre
7 between the cost of each route must be repeated in
order to revise the decision as to which of the available
routes is a least cost route. The results of this
25   decision must then be passed on to the LCRMs 3. In order
to update the routing information stored in each LCRM 3,
data to which the LCRM 3 refers by addressing a look up
table is periodically transmitted to each mobile
telephone 1.

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The updated least cost route information broadcast by the control centre 7 to each LCRM 3 via at least one of the cellular telephone service providers is preferably encrypted and compressed as a coded signal.

5   It is envisaged that in accordance with a first embodiment such transmission of updating information to the LCRMs 3 would be made as a multipoint broadcast during periods of minimum or off peak cellular telephone
10   traffic.

Both routing and subsequent billing via the control centre 7 are determined by adding dialling information to the user generated number.

15   Figure 4 illustrates a schematic diagram of the dialling information sent from an LCRM 3 in this embodiment.

The dialling information conforms to the 1xxx standard
20   whereby the first digit sent is "1" followed by a number "XXX" (network reference 50) which identify one of the networks 5A, 5B, 5C through which the call is to be routed. A charging information field is then transmitted which includes a control reference number 51 which
25   indicates to the appropriate network service provider that the operator of the control centre 7 needs to be billed for the cost of the call. A customer identification field including customer reference number 52 is then sent which is forwarded to the control centre

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7 so that the operator of the control centre may bill the
user of the telephone 1.   Finally the user generated
dialled number 53 is transmitted.

5   In this embodiment, the mobile telephone 1 forms part of
the GSM network in which a service named Cell Broadcast
is utilised to send short messages to all mobile
telephones in a given geographical area as a multipoint
broadcast message.

10   In the example of Figure 2, the Cell Broadcast service is
used to send updating information for updating the least
cost route tables stored in the mobile telephone 1. This
is illustrated schematically in the right hand portion of
Figure 2 which illustrates that the message data handling
15   circuit 121 of the mobile telephone 1 is used to input
data to a decision table 122 corresponding functionally
to the LCRM tables 134 and 135 described below with
reference to Figure 3. A keypad 127 allows the user to
20   input a dialled number.   The processor of the mobile
telephone 1 includes a route selector 123 which refers to
the decision table 122 before processing a user input
call destination to determine the channel to be used for
the outgoing call to a selected service provider and to
25   enable an appropriate prefix to be added to the user
dialled number. A transmitter and receiver circuit 124
is provided for transmitting and receiving transmissions
of telephone calls and to receive the Cell Broadcast
message data input to the message data handling circuit

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121. A decoder and encoder circuit 125 and a call
processing circuit 126 provide an interface between the
transmitter and receiver circuit 124 and both the route
selector 123 and the message handling circuit 121.

5   Further embodiments will now be described using
corresponding reference numbers for corresponding
features where appropriate.

10   Figure 3 illustrates schematically an example of a mobile
telephone 1 having routing means having decision tables
referred to below as look-up tables 134,135. An input
device in the form of a keypad 130 generates an input
signal representative of a user generated call number
15   which defines the user selected call destination.
Routing information is obtained by accessing the look-up
tables 134 and 135, only one of which is currently
designated as being active by an active memory
designating means 140. The active memory is designated
20   according to which of the tables 134 and 135 was last
updated, thereby leaving an inactive memory to await the
receipt of further updating information, following
receipt of which it will then become the active memory.

25   As shown schematically in Figure 3, an updating device
136 is available to update Table 2, the currently
inactive memory, while a selector 133 is available to
select routing information from Table 1, the currently
active memory, in dependence upon the data input to the

selector 133 from the input device 130. In this way, a
user generated call destination in the form of a dialled
telephone number is used by the selector 133 to generate
an address for accessing the memory of the currently

5   active look-up table. Data is read from the address by
a data reader 301 and input to a communications channel
selector 300 and a code generator 131.

The communications channel selector 300 selects a

10   communications channel to be used for wireless
communication between the mobile telephone 1 and a base
station 4A of the system and is connected to the
transmitter 302 and receiver 137 to allow setting of the
appropriate channel frequency and protocol for

15   communication.

The code generator 131 prefixes the input signal with a
prefix signal which is representative of a selected
prefix code defining the preferred (land line) network

20   connection route and including other data relating to
customer identification and charging as illustrated in
Figure 4.

Although the selector 133 locates the required routing

25   information primarily in response to an input from the
input device 130 of the destination call number, the
address information also includes time period data and
day of the week data from a calendar 141. The updating
device 136, which updates whichever of the decision

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tables 134 and 135 is currently inactive, receives
updating information from the receiver 137 and a decoder
138.

5   A clock 139 and the calendar 141 are also updated by the
received broadcast information via the receiver 137 for
providing the additional address information for the
selector 133 in addressing the look up tables 134 and
135.

10   The routing information may be updated at any time but
would preferably be updated either at regular intervals,
preferably between one day and one month, or whenever the
preferential routing information changes.

15   Figure 5 illustrates a further embodiment of a mobile
telephone in which a processor 500 controls operation of
the various sub-units of the telephone by software
implementation. As shown schematically in Figure 5, the
20   processor 500 is connected via a databus 511 to a read
only memory 501, a random access memory 502, a data input
503 in the form of a keypad and a display 504 in the form
of a liquid crystal display. A SIM (Subscriber Identity
Module) card 505 is also connected to the databus 511 and
25   contains identifying information which is unique to the
telephone and user.

Also connected to the databus 511 is an audio processor
506 connected to a microphone and speaker circuit 507.

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The databus 511 is also connected to transmitter and
receiver circuits 509 connected to an antenna 510.

The random access memory 502 includes look-up tables 134
5   and 135 corresponding to the tables described above with
reference to Figure 3, the tables being accessed in a
similar manner, except that the functions of the selector
133, clock 139, calender 141, data reader 301, and
communications channel selector 300 of Figure 3 are
10   performed in the embodiment of Figure 5 by the processor
500 and associated circuits described above.

Conventional mobile telephones are generally capable of
being registered to a single mobile telephone service
15   provider, even though the telephone includes circuitry
which is capable of registering the telephone with any
one of a plurality of available service providers. The
process of registration which is performed each time the
telephone is switched on or moves into an area falling
20   within an active cell of the communications system
involves transmission of an identification code stored in
the SIM card 505 to the service provider. The service
provider registers the identification information and
allocates facilities including a communications channel
25   for received calls to be routed to the telephone and for
outgoing calls to be made via the service provider.

Mobile telephones in accordance with the present
invention perform this registration procedure as shown in

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Figure 6 by first scanning at step 60 available communication channels for which it has functional capability in order to obtain information on which service providers have channels currently available. When a service provider of an available channel is identified in this manner, the telephone attempts at step 61 to complete registration over the appropriate communication channel. On completion, the telephone then scans at step 62 to locate any further service providers and, if any new channel is found at step 67, identifies the service provider at step 68 and completes registration in turn at step 63 so that the telephone will be simultaneously registered with a plurality of service providers. In order to complete this task, it may be necessary for the SIM card 505 to contain a plurality of respective identification codes appropriate to the requirements of the different service providers.

This process of scanning available communication channels, typically on different operating frequencies, is repeated at scanning intervals of several minutes in order to maintain an up-to-date list of available service providers with which the telephone is registered. Typically this will require operating at a plurality of different frequencies to access the channels of the respective service providers.

At step 64 the telephone 1 elects one particular service provider to provide a "home" channel 81 as illustrated in

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Figure 8 for receiving incoming telephone calls to the
telephone so that the home channel thereafter requires
continuous monitoring by the telephone. Operation of the
transmitter and receiver circuits 509 to additionally

5   perform scanning and registration therefore requires the
capability to operate simultaneously at two different
frequencies or to switch rapidly from one frequency to
another so that any incoming call signals are not missed
on the home channel 81.

10

When, as part of the ongoing monitoring procedure, a
service provider is newly identified as having an
operating frequency which is usable within the current
cell, the telephone 1 transmits a message to the newly

15   found service provider to indicate the presence of the
telephone and include the identification information
contained in the SIM card 505. After an authentication
procedure is performed by the service provider in order
to confirm that the user of the telephone is validly

20   authorised for use of the service, a communication
channel facility is established between the telephone and
the service provider. The telephone 1 then requests from
the service provider an indication of whether least cost
routing information is to be broadcast by this service

25   provider and received in the newly opened communications
channel. In this way the processor 500 is able to
maintain a running check on the identity of the service
provider forwarding received (incoming) messages to the
telephone and to identify at step 65 which of the

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available service providers will be sending the updating information for the look-up tables 134 and 135. In the example of Figure 8, service provider base station 4D provides a channel 80 used for updating information and service provider base station 4A provides the "home" channel 81 for received calls. (Figure 8 also illustrates a selected channel 83 for outgoing calls and a further channel 84 which is currently available for selection.)

Having identified the service provider which will be forwarding the updating information for the look-up tables, the mobile telephone 1 requests from the service provider information defining the frequency with which the telephone should forward a request for updating information to the service provider. When this information is received, the processor 500 sets in progress a routine such that a request for updating information is automatically generated by the telephone 1 and communicated to the responsible service provider (base station 4D) at the required interval. In response to such a request, updating information is communicated via the communications channel 80 to the telephone 1 and stored in whichever of the look-up tables 134 and 135 is currently inactive, following a procedure analogous to the procedure described above with reference to the embodiment of Figure 3.

In this way, updating information can continue to be

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received and stored in the inactive table while routing
information is being simultaneously extracted from the
currently active table on demand.

5   To deal with the eventuality that more than one of the
acquired service providers indicates that it is available
to provide updating information, or more than one service
provider indicates that it is to forward incoming
messages, the CPU 500 is provided with a routine for
10   arbitrating to elect only one such service provider in
each instance, as appropriate.

At step 66, the look-up table is updated to include a
current list of those channels which are available before
15   waiting at step 69 for the end of a scanning interval
before beginning to repeat the channel scanning process
of steps 62, 63, 67 and 68. The look-up table includes
a carrier availability table for this purpose, as
described below with reference to Figure 11.

20

The broadcast of updating information to the mobile
telephone 1 may be effected using the SMS (short message
service) facility which is available in a number of
cellular telephone networks.

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A point to multipoint broadcast is available using SMS,
thereby enabling a large number of mobile telephones in
a given area to be simultaneously updated, or rather all
of those telephones in the area which are turned on and

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able to receive the broadcast signal at the time of transmission. Alternatively, a group broadcast may be made to a group of users. If a message is not received by a given user, a message centre stores the message for a predefined period to enable the updating information to be downloaded at the next instance of registration of the user in the network.

A further alternative is that the updating information could be transmitted using point to point broadcast to each destination.

According to a further modified embodiment, the updating information additionally includes identification information providing authorization for use with additional service providers. This is appropriate in instances where the telephone SIM card contains only identification information providing authorization for use of a single service provider, or an incomplete set of service providers where additional service providers are in fact available for operation.

The provision of this additional identification information then facilitates registration of the telephone with all available service providers.

In use as shown in Figure 7, a user of the telephone 1 initiates at step 70 an outgoing call by inputting a telephone number corresponding to a desired call

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destination using the keypad input 503 of Figure 5. The
processor 500 determines from the RAM 502 which of the
look-up tables 134 and 135 is currently designated as
being active and generates an address of the look-up
table corresponding to the user generated call number,
the current time indicated by clock 508 and other
parameters for which the processor is programmed to
utilise in address generation. The preferred route
information is read at step 71 from the selected look-up
table and utilised to determine at step 72 the selected
channel for operation of the transmitter and receiver
circuits 509 which are then instructed accordingly by the
processor 500, setting the required frequency and
communications protocol.

The prefix code is added to the dialled number at step 73
and the call is initiated at step 74 for transmission by
the transmitter circuit 509 to the base station 4C of the
service provider of the selected channel 83.

As shown in Figure 1, the base station 4A of the selected
service provider receives the transmission and
establishes forward connection to the call destination
telephone 2 via whichever of the networks 5A, 5B and 5C
is indicated in accordance with the preferred route
information.

Connection is established between the telephone 1 and the
call destination 2 and the telephone call proceeds.

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Billing information is collated by the control centre 7
for subsequent payment of the telephone user and payment
to the service provider and selected network.

In this way, routing information determined on a least
cost basis enables the user of the mobile telephone to
maximise efficiency in making calls over several
networks.

In the event that the preferred route information cannot
be successfully utilised because one or other of the
service provider channels or networks is unavailable, a
second choice is read from the look-up table and
connection again attempted. If this second choice route
also fails, a default connection mode is adopted in which
connection is made using the home channel 81 to a service
provider who then has responsibility for determining the
route for forward connection to the destination 2.

Optionally, a prefix number may be added at step 73 to
the user generated telephone number, including the
information referred to above with reference to Figure 4.

According to a further alternative embodiment, the
processor 500 would be programmed to provide for
registration only with a single service provider. At the
point of selection of the preferred route and preferred
service provider for cellular communication, the mobile
telephone 1 would then, if the preferred route indicates

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a service provider other than the presently registered service provider, initiate registration with the preferred service provider in the manner indicated above. On completion of registration, the routing of the telephone call then proceeds by selecting the preferred communication channel and adding the prefix code to the dialled number input by the user to the keypad input 503.

If however registration at this point is not possible, for example because a lack of signal strength means that the communications channel of the service provider selected is not in fact available, the processor 500 is programmed to repeat the selection process to access a second choice route. If no preferred route can be accessed, the processor 500 is programmed to adopt a default route which uses the communication channel of the already registered service provider.

The above described embodiments utilise two look-up tables 134 and 135 in order to allow one look-up table to be ready for use while the other is being updated.

Alternatively, a single look-up table may be utilised and the timing of the updating operation controlled by the processor 500 such that conflict does not occur between the updating of the look-up table and the process of accessing the look-up table to obtain routing information.

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The option of having a single look-up table may be applied to each of the above described embodiments, an implementation of a single look-up table circuit being described below by way of example with reference to

5   Figure 9.

Figure 9 illustrates schematically the circuit of a mobile telephone using corresponding reference numbers to those of preceding figures for corresponding elements

10   where appropriate and further including a single look-up table 900.

An updating device 136 is arranged to update the information in the look-up table 900 by overwriting

15   existing entries in the look-up table with updating information for the corresponding address whenever blocks of updating information are received from an input 901 of updating information.

20   Typically the entire contents of the look-up table 900 will not be transmitted in a single burst, the contents being instead divided into blocks transmitted over time.

Each block may contain information for refreshing data at

25   a number of addresses and this data may be buffered in a buffer memory 902 the updating device 136 during the updating procedure.

The route selector 133 obtains information from the look-

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up table by addressing specific information, the look-up table 900 being controlled such that read and write operations do not occur simultaneously.

5   As shown in Figure 9, the updating device 136 is also arranged to refresh the information stored in the calendar 141 and clock 139 in order to avoid the effects of drift of the internal clock of the mobile telephone.

10   The input 901 of updating information is represented only schematically in Figure 9 and may be constituted by the decoder 138 of Figure 3 cooperating with the receiver 137 (not shown in Figure 9) to receive packets of data in a wireless broadcast. Alternatively, the input of updating
15   information may comprise a connection to a docking station (not shown in Figure 9) as described below with reference to Figures 13 to 16.

       The input of updating information 901 also receives
20   information identifying which cellular networks are currently available for selection to provide communication channels, the information being obtained as described above with reference to Figure 6.

25   The input of updating information 901 may further receive information originating from networks such as networks 5A, 5B and 5C in Figure 1 which may initiate the broadcast of messages concerning their current performance or availability.

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In the above described embodiments, the single look-up
table 900, or where appropriate the first and second
look-up tables 134 and 135, are stored as part of the
random access memory 502.

5

Alternatively, the look-up table information may be
stored within the SIM card 505 as illustrated
schematically in Figure 10.

10   In the embodiment of Figure 10, the SIM card 505, in
addition to storing the personal information normally
stored in the SIM card regarding the user for
registration purposes etc, stores the look-up table 1000.
The mobile telephone of Figure 10 therefore accesses the
15   look-up table 1000 by reading information addressed to
the SIM card 505 and updating of look-up table 1000 is
effected by writing to the appropriate address in the SIM
card 505. Functionally, the mobile telephone of Figure
10 performs otherwise in an equivalent manner to the
20   mobile telephone described above with reference to Figure
9.

The SIM card utilised in the embodiment of Figure 10 has
a memory of 1 Mbyte capacity, this capacity being
25   sufficient to accommodate the normal requirements of
memory in the SIM card and approximately 10 Kbytes of
data constituting the look-up table 1000. It is
commonplace for the SIM card to be supplied separately
from the main body of the mobile telephone and for the

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SIM card to be inserted into the mobile telephone at the point of sale. It is therefore envisaged that in accordance with the present invention a SIM card should be prepared for such installation so as to already include a look-up table populated with data of the type described below with reference to the tables 1100, 1101, 1102 and 1103 of Figure 11. Similarly, a user who acquires a new mobile telephone may transfer his existing SIM card to the new mobile telephone, the look-up table 1000 then already being populated with data at the point of installation into the mobile telephone. Once the new mobile telephone is used, updating information may then be received to bring the data up to date. The SIM card 505 in a preferred embodiment is programmed with the look-up table data and related applications by the control centre 7 and supplied for use with mobile telephones, either by being pre-installed in mobile telephones or installed at the point of sale.

Figure 11 illustrates the structure of the look-up table 900, being equivalent to the look-up table 1000 of Figure 10 and each of the look-up tables 134 and 135 of Figure 3.

In Figure 11, the look-up table 900 is seen to comprise an exclusion table 1100 which contains details of those call destinations which are excluded from the least cost routing function. The look-up table 900 further comprises a routing table 1101 which is a look-up table

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containing preferred route codes representative of preferred routes via one or more networks corresponding to each destination.

The look-up table 900 also includes a carrier selection table 1102 providing, for each preferred route code, a list of carrier selections in order of preference such that alternative carrier selections are defined if the first choice cannot be used due to the required channel being unavailable. For each channel selection, channel selection data is stored.

The look-up table 900 further includes a carrier access table 1103 to convert the channel selection data obtained from table 1102 into actual prefix codes to be added to the dialled number and actual channel selection data for controlling the channel selector 300 of Figure 9.

The look-up table 900 also includes a carrier availability table 1104 which is updated to include information as to which channels are currently available to the mobile telephone 1 using data obtained by the communications channel controller 901 of Figure 9.

The look-up table 900 also includes default route data 1105 to be used in the event that the normal routing function is not fulfilled by the data available in tables 1101 to 1104. The default route data may include a default prefix code to be added to the user dialled

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number in order to route the call via a predetermined
network or service provider.

Finally, the look-up table 900 also includes network
status data 1106 comprising status information received
from broadcasts originating not from the control centre
7 but from networks over which calls may be routed. Such
networks, for example networks 5A to 5C in Figure 1, may
broadcast status messages in the event that network
performance is temporarily degraded or in instances where
the network is totally unavailable.

Figure 12 illustrates the manner in which the look-up
table is addressed. Although Figure 12 is described with
specific reference to the embodiment of Figures 10 and
11, the method utilised in Figure 12 may equally well be
applied to each of the preceding embodiments.

At step 1200, the processor 500 addresses the exclusion
table 1100 using the call destination telephone number
dialled by the user to determine an address in the
exclusion table in order to read information indicating
whether the call destination is excluded from the least
cost routing procedure. The processor 500 at step 1201
determines from this information whether the call
destination is excluded and if so, the call is made
directly at step 1202 without using the routing
procedure, the home channel 81 being utilised and the
call destination number dialled without insertion of any

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prefix.

If however the call destination is determined not to be
excluded at step 1201, the processor proceeds to step
1203 of addressing the routing table to look-up a
preferred route code. Each preferred route code is a
pointer for indicating the preferred carrier, ie. service
provider for the cellular network connection, and the
network selection for onward routing such as via land
line telephone network. The preferred route code is
therefore a code constituting an address for addressing
the carrier selection table 1102 at a next step 1204, the
processor in this step addressing the carrier selection
table with the preferred route code in combination with
call characteristic data in order to look-up a priority
list of carrier selections to be used in routing the call
in order of preference and subject to availability. The
call characteristic data consists of those
characteristics of the call such as time and date of
initiating the call for which the carrier selection table
includes a corresponding variable. Additional parameters
included in the call characteristic data include the
country location from which the call originates, for
example whether the call originates in the United Kingdom
or France, and the type of communications signal for
which the call is primarily intended. Such signals may
for example include voice signals, image signals using a
facsimile protocol, or alpha-numeric data in various
forms including Internet protocols used for email and web

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pages. A knowledge of the type of data may be derived by recognising those dialled numbers which correspond to modems or Internet service providers for example. The country location may be derived from information obtained during registration since the network ID of each network found may be compared with a network ID list held in the SIM card 505 and which includes country information.

The processor 500 then takes the carrier having the highest priority in this list and, at step 1205, addresses the carrier access table 1103 to obtain the prefix code and channel selection data.

At step 1206, the processor 500 then accesses the carrier availability table 1104 to determine whether the channel identified by the channel selection data is one of the available channels. If at step 1207 the processor determines that the channel is in fact available, and that the selected route is not precluded by an adverse indication from accessing the network status data 1106, the processor at step 1208 implements the making of the outgoing call, adding the selected prefix code to the user dialled number and using the mobile telephone network of the service provider with whom registration was made for the selected channel.

If however at step 1207 the channel identified by the channel selection data is determined not to be available, the processor 500 determines at step 1209 whether any

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further carriers remain on the list and, if the answer is
yes, the processor at step 1210 addresses the carrier
access table with the next highest priority carrier
selection in the list obtained from step 1205.

5

Control then returns to step 1206 and, if the channel is
available, the call is made at step 1208.

If however none of the selected channels are determined
to be available and at step 1209 it is determined that
there are no further carriers on the list, control passes
to step 1202, at which the processor implements the
making of the call without using a default setting. The
default setting may use the default data 1105 to route
the call using the home channel 81 and for subsequent
routing of the call to be made in accordance with the
user dialled call destination number. Alternatively, the
default setting may require insertion of a prefix code of
a predetermined service provider. The default setting
20   enables the mobile telephone to continue to function
under adverse conditions such as a lack of available
channels or when the tables 1101 to 1104 do not contain
sufficient routing information.

25   Figure 13 illustrates a further embodiment of a mobile
telephone 1 in accordance with the present invention in
which the input of updating information 901 of Figure 9
is constituted by a docking station 1300 enabling the
mobile telephone to receive updating information

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transmitted over a land line network, described by way of example as a cable network 1301.

The mobile telephone 1 of Figure 13 is shown detachably connected to a docking station 1300 which includes a connector 1302 of the type conventionally provided for use with such mobile telephones. The connector 1302 provides multiple contacts enabling data communication and also enabling a recharging power supply 1303 to be connected to the mobile telephone to facilitate charging of the internal battery 1400 shown in Figure 14. The docking station 1300 is in this example in the form of a cradle which supports the mobile telephone during both charging and data transfer in a position in which the display 504 is visible to the user and the telephone may be available on standby to make and receive calls.

The docking station 1300 receives a data input 1304 obtained from a decoder 1305 which converts optical cable signals into electrical signals. For convenience, the updating signal contained in the input 1304 is multiplexed with a television signal for a television receiver 1306 which receives cable television channels via the decoder 1305 from the network 1301.

The data is encoded in the vertical blanking interval of the television signal of one of the received television channels and decoded in a VBI (vertical blanking

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interval) decoder 1401 as shown in Figure 14. Figure 14 illustrates schematically the circuits of both the mobile telephone 1 of Figure 13 and the docking station 1300, using corresponding reference numerals to those of preceding figures where appropriate for corresponding elements.

The docking station 1300 includes its own CPU 1402 together with associated RAM 1403 and ROM 1404 and an interface 1405 which facilitates data communication with a cooperating interface 1406 in the mobile telephone 1. Connection between interfaces and 1405 and 1406 is made via the connector 1302.

The connector 1302 also communicates charging current from a power control circuit 1407 of the docking station 1300 to a charging circuit 1408 of the mobile telephone 1 enabling the internal battery 1400 to be recharged in a controlled manner.

The control centre 7 broadcasts a multipoint updating signal during off-peak use of the data channel provided by the VBI, the data then being decoded and transmitted to the mobile telephone 1 for updating of the look-up table 1000. In this example, a single look-up table 1000 is provided, the updating information being buffered in buffer memory 902 within the RAM 502 and used to overwrite data stored in the look-up table on a block by block basis.

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A further alternative embodiment will now be described
with reference to Figures 15 and 16 using corresponding
reference numerals so those of preceding figures where
appropriate for corresponding elements.   The mobile
telephone 1 of Figure 15 is similarly provided with a
docking station 1500 to which it is detachably
connectable, the docking station 1500 providing
connection with a telephone line 1501 to a local exchange
of the public service telephone network 1502.   A
conventional telephone set 1502 is also shown connected
to the line 1501.

The docking station 1500 is also connected to receive
power from a power supply 1303 and, as shown
schematically in Figure 16, communicates charging current
to a charging circuit 1408 of the mobile telephone 1 via
a control circuit 1407.

The mobile telephone 1 of Figure 16 includes a modem 1600
which is connected to the telephone line 1501 via the
connector 1302 when the mobile telephone 1 is coupled to
the docking station 1500.

In order to update the look-up table 1000, an outgoing
call is initiated by user actuation of the mobile
telephone 1 using the modem 1600 to the control centre 7
requesting a transmission of updating information.   The
mobile telephone 1 may be provided with a menu of
functions for operating the mobile telephone and the

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initiation of a telephone call request to the control
centre 7 for updating the LUT may then be included as one
of the available functions accessed via the keypad 503.
The control centre 7 responds by transmitting an encoded
5   updating message received by the modem 1600 and processed
by the CPU 500 to update the information contained in the
look-up table 1000 in a manner described above.

After charging the internal battery 1400 and updating of
10   the look-up table 1000, the mobile telephone 1 is
detached from the docking station 1500 for normal use.

A further alternative embodiment is illustrated in Figure
17 which will now be described using corresponding
15   reference numerals to those of preceding Figures where
appropriate.

In Figure 17, a mobile telephone 1 is detachably
connected to a docking station 1500, electrical
20   connection being made using a connector 1302 for
supplying power to a charging circuit 1408 and
communicating data via an interface 1406 of the mobile
telephone and a cooperating interface 1405 of the docking
station.
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The docking station 1500 also includes a modem 1600
connected to a telephone line 1501 which, in a similar
manner to the arrangement of Figure 15, is connected to
the public service telephone network 1502. The docking

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station 1500 includes a processor 1402, RAM 1403 and ROM
1404 as well as a control panel 1700 allowing a user to
initiate a telephone call from the docking station to the
control centre 7.   The processor 1402 controls the
5   outgoing call to include an encoded request to receive
from the control centre 7 a transmission of updating
information for the look-up table 1000.   The control
centre 7 responds by transmitting blocks of updating
information which are received via the modem 1600 and
10   stored in RAM 1403 by the processor 1402.   The data is
transmitted between the interfaces 1405 and 1406 and
stored in the buffer memory 902 within RAM 502 of the
mobile telephone 1.   The processor 500 of the mobile
telephone 1 then uses the data held in buffer memory 902
15   to update the look-up table 1000 within the SIM card 505
by over-writing existing data at   corresponding
addresses.

The above process typically requires that the mobile
20   telephone 1 should be turned on and connected to the
docking station 1500, following which the user actuates
the control panel 1700. After the updating information
has been downloaded from the control centre 7, the
control centre signals completion of the transmission and
25   the telephone call is terminated. The user is therefore
required periodically to remember to utilise the docking
station 1500 and to actuate the control panel 1700 to
receive updating information.   Since, however, the
docking station 1500 also allows charging current to be

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communicated to the charging circuit 1408 for charging
the internal battery 1400, the user will routinely
utilise the docking station for the purpose of charging
the battery and at the same time be reminded to refresh
5   the data in the look-up table.

The CPU 500 may alternatively be programmed to
periodically cause a prompting message to be generated to
remind the user, the message being displayed using the
10   display 504.

Figure 18 illustrates a further embodiment in which a
call from mobile telephone 1 is routed to a destination
telephone 2 via a packet switched network 1800 which
routes calls between cellular mobile telephone network 8A
15   and local exchange 6A. By analogy with the example of
Figure 1, the mobile telephone 1 communicates with base
station 4A via a channel selected as in the case of
previous embodiments and in accordance with a selected
20   preferred route code obtained by accessing a look-up
table within the mobile telephone. In the present
embodiment, the route code further defines the manner in
which the packet switched network routes the call by
defining a string of network addresses. This information
25   is contained in the transmitted packets of information
and is read by the switching nodes of the network.

In the example of Figure 18, the string of network
address codes includes network addresses for nodes 1801

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and 1802. Since the switching nodes of the network may be operated by different service providers, the cost of call connection may be determined by a sum of charges from the respective service providers. The string of network addresses thereby enables an optimum or least cost route to be defined.

The string of network addresses may similarly include specific addresses which are to be avoided in the selected route. In a further example therefore, if network node 1802 is referred to in the string of network addresses as an address to be avoided, the preferred route including network node 1801 might be diverted via node 1803 to avoid node 1802.

The manner in which route selection is performed by switching nodes of the network may also be influenced by the network address of the originator of the call. This information is embedded in the packetised data and read by the switching node. The present embodiment also includes the facility for embedding source address information in the packetised data which indicates the origin of the call as being a predetermined network node which may be selected to in fact be different from the actual origin. This technique, known as "masquerading" the network address of origin, may be useful in achieving optimum network switching.

The source address information is therefore included in

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the look-up table and forms part of the preferred route
code obtained by accessing the look-up table.

Figure 19 illustrates schematically the prefix code which
may be included in such packetised data and which
analogous to the prefix code of Figure 4. In Figure 19,
the prefix code to be included in the packetised data is
seen to comprise a header code 1900, a string of network
address codes 1901, the source address information 1902,
control reference information 1903 and details of the
dialled number 1904. The control reference 1903 contains
information enabling appropriate network service
providers to forward billing information to the control
centre 7 for costs associated with making the call. The
user may thereby be ultimately billed by the control
centre 7 for at least some of the services provided by
the network service providers.

As indicated above with reference to Figure 11, network
status data obtained from network service providers may
be broadcast and stored in the look-up table to provide
information on the status regarding performance and
availability of switching nodes of the packet switch
network 1800. This information is utilised during the
route selection procedure, thereby enabling the resulting
string of network addresses to be defined so as to avoid
specific network nodes or alternatively to ensure that
the call is routed via a specific node, thereby taking
advantage of the intelligence provided by the network

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nodes themselves.

The information provided by the control centre and
downloaded into the look-tables remains the primary
5   source of information determining the selection of
preferred route, the information provided by the network
nodes themselves providing an additional layer of support
and enhancement to the route selection process.

10   Figure 20 illustrates the manner in which updating
information for updating the look-up table may be
obtained in the form of web pages. In the example of
Figure 20, connection is illustrated between a mobile
telephone 1 and a destination telephone 2 via the public
15   service telephone network 2000 and local exchange 6A. An
Internet service provider 2001 is shown connected to the
public service telephone network 2000 so as to be
accessible to the mobile telephone 1 by dialling the
telephone number of the Internet service provider. The
20   Internet service provider 2001 provides access to the
Internet 2002 so that the mobile telephone 1 may gain
access to a server 2004 operated by the control centre 7
by outputting the URL (Uniform Resource Locator) of the
server as a network address for a request for updating
25   information. In response to such a request for updating
information, the server 2004 outputs data in an Internet
protocol format defining a web page which is transmitted
to the mobile telephone 1 and the relevant updating
information extracted and stored in the manner described

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above.

Figure 20 also illustrates an example of a call made by
the mobile telephone 1 to a communications device other
than a conventional telephone and in this example
comprising a personal computer 2005 which includes a
modem. Connection to the personal computer 2005 is made
via the public service telephone network 2000 and
Internet service provider 2001 which provides access to
the Internet 2002. The URL or network address of a
further Internet service provider 2003 provides
connection with the personal computer 2005. Data in a
variety of formats may be communicated between the mobile
telephone 1 and the personal computer 2005. For this
purpose, the mobile telephone 1 may have integrally
provided the necessary processing apparatus for inputting
and outputting such data or alternatively the mobile
telephone 1 may be temporarily connected to an additional
processor such as a personal computer, facsimile machine
or organiser using a cable connection or infrared link or
the like. The current trend however is for the mobile
telephone 1 to be unitarily provided with a variety of
data processing facilities and for the mobile telephone
1 to include an organiser function or a processor with
capabilities approaching those of a personal computer.
As such, the term "mobile telephone" is to be construed
broadly to include such alternative forms of wireless
communications devices usable with cellular networks.

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As indicated above, the choice of preferred route may
depend upon the data format of the call and defines one
of the parameters by which the look-up table is addressed
in order to obtain the preferred route. The route may
thereby be optimised to be appropriate to the type of
data in terms of bit rate and immunity from errors or
other performance criteria since for example the
transmission of image data requires greater bandwidth and
lower error tolerance than voice signal communication
where real time capability is of more importance and
lower bandwidth can be tolerated.

Figure 21 illustrates schematically the manner in which
the present invention has application to communication
systems in which packet switching techniques are
universally applied. In Figure 21, a packet switching
network includes a region 2100 which corresponds to the
cellular network systems referred to above and including
an air interface, each of a number of mobile telephones
1 constituting nodes of the packet switching network. A
further region of the network 2101 may be constituted
either by the public service telephone network or the
Internet or a combination thereof and a remaining portion
2102 provides local connection to a telephone 2 and PC
2005. The portion 2102 may for example be a cable
network or another form of network which is equivalent in
effect to the local exchange 6 of the embodiment of
Figure 1.

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In a packet switched network such as illustrated in
Figure 21, the notion of a dialled telephone number may
be replaced by a network address such as a URL.
Alternatively, the destination of a call may be defined
using either a telephone number or URL depending on the
nature of the destination and the type of data to be
transmitted.

Figure 22 illustrates schematically the manner in which
the mobile telephone 1 may be programmed such that the
processor 500 is provided with program code for carrying
out the method of call routing described in the above
embodiments.   The code may be initially stored in a
portable storage medium 2201 which is processed in a
manufacturing processor 2202 to produce telephone 1 in
which the processor 500 is provided with the necessary
code in ROM or RAM.   The processor 2202 may receive
alternatively the required code from the control centre
7 via a communications channel as a communications signal
2203.

A SIM card 505 may similarly be programmed by the
processor 2202 so as to include an initial set of data
constituting the look-up table 900. The SIM card 505 may
then be assembled with the mobile telephone 1 prior to
shipping to a customer or may alternatively be separately
despatched for insertion at the point of sale.

Although in the described embodiments communication has

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been described as occurring between a mobile telephone 1
and a telephone 2, the terminal destination may
alternatively be any form of telecommunications
apparatus, for example a facsimile machine or computer
modem, a combination of telephone with radio, alarm
clock, answering machine and the like. Alternatively the
telephone 2 may be a private exchange such as private
automatic branch exchange (PABX) or a network signal
router. Similarly, the mobile telephone 1 may be any
form of mobile cellular terminal and the above
embodiments should be broadly construed accordingly. The
communications signals communicated via telephone calls
in the embodiments described herein may be in analogue or
digital form and may be representative of voice messages,
image data or other forms of data such as HTML.

In Figure 1 the local exchanges 6A, 6B, 6C are shown
separate from the networks 5A, 5B, 5C. However, the
local exchanges 6 may also form part of a network.

Although in this embodiment the control centre 7 is
connected to the networks 5A, 5B, 5C via the public
service telephone network so that the networks 5A, 5B, 5C
can transmit billing information to the control centre 7,
alternatively the billing information may be sent by any
other suitable link, for example a satellite link which
does not form part of the networks 5A, 5B, 5C. Different
networks 5A, 5B, 5C may send their billing information to
the control centre 7 by different ways.

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It will be appreciated that the teaching of the described embodiments may be applied to other GSM-based mobile telephone networks or Code Division Multiple Access (CDMA) based networks. An example of a suitable mobile phone network is the Personal Handyphone System (PHS).

The embodiment referred to above with reference to Figure 13 includes a cable network 1301 as a means of communicating a multi-point broadcast. Other broadcasting networks may alternatively be utilised, including for example a satellite television network or the Internet, provided that the decoder 1305 of Figure 13 is replaced by an appropriate means of decoding the broadcast information.

In any of the embodiments described herein which receive updating information via a channel of a mobile telephone cellular network, as for example described with reference to Figures 1 to 12, the mobile telephone 1 may be configured to receive web pages by means of signals encoded using WAP (Wireless Application Protocol) or any equivalent version of HTML (HyperText Markup Language). For such mobile telephones, the updating information for updating the look-up tables may be downloaded to the mobile telephone in the form of a web page. The mobile telephone 1 in this instance may be configured such that the processor 500 periodically generates a request for a web page by signalling to the URL (Uniform Resource Locator) of the control centre 7 which responds by

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downloading the web page. The web page may be displayed
by the display 504 of the telephone 1 or alternatively
the processor 500 may be programmed to recognise such web
pages and store the received information without
5   displaying the web page.

The received information may be processed and the
updating information stored in buffer memory 902 prior to
updating the look-up table 900 as described above with
10   reference to Figure 9.

Such an embodiment requires that the processor is
provided with a browser program and a program enabling
received information in the form of WAP to be converted
15   to data which may be written to the look-up table 900.
In the described embodiments, after selection of a
channel to provide transmission via the air interface 9,
the data contained in the look-up tables determines
subsequent routing over networks selected from a
20   plurality of available networks 5A, 5B and 5C for example
as shown in Figure 1. It may however be appropriate for
the control centre 7 to populate the look-up tables with
data which requires that a single one of the networks,
such as a selected network 5A, is always utilised when
25   routing calls. This may be appropriate for example where
the service provider of the selected network 5A also
controls the control centre 7.

In the above described embodiments with reference to

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Figure 4, the dialling information conforms to the 1xxx
standard wherein the first digit is "1" followed by a
number "xxx" (network reference 50).   Alternatively,
other network access methods may be utilised such as for
example the 0800 prefix currently used for freephone
telephone numbers.

In the described embodiments, a routing decision based on
least cost for a telephone call connected via a
conventional network will generally compare call costs
for different routes on the basis of cost per unit time,
e.g. cost per minute.   Alternatively, when connection is
made via a digital network, and in particular a packet
switched network, it will be more appropriate for a
routing decision to be based on capacity pricing such as
a cost per kilobyte of data.   Both of the above
comparisons are to be taken as falling within the meaning
of least cost routing in accordance with the present
invention.

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CLAIMS:

1.   A method of operating a mobile telephone (1) in a
cellular telephone communications system in which a
plurality of service providers provide respective
5   alternative communications channels (80,81,82,83);
comprising the steps of;

      storing routing information in a look-up table (122;
134,135; 900,1000) of the mobile telephone such that the
table is populated with data in the form of preferred
10   route codes, each preferred route code being
representative of a preferred route for connection to a
respective call destination;

      originating an outgoing telephone call by the input
of user generated call destination information;

15   accessing the look-up table using an address
determined at least in part by the call destination
information to obtain a selected preferred route code;

      selecting one (83) of the communication channels in
accordance with the preferred route code; and

20   establishing communication for the outgoing
telephone call for a call destination corresponding to
the call destination information via the selected
communication channel of a corresponding selected service
provider (4C).

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2.   A method as claimed in claim 1 wherein the preferred
route codes comprise the results of a route selection
decision by a control centre (7) remote from the mobile
telephone.

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3.   A method as claimed in claim 2 wherein the decision
is based at least in part on least-cost.

4.   A method as claimed in any of claims 2 and 3 wherein
the decision is based at least in part on performance of
at least one network selected in accordance with the
preferred route.

5.   A method as claimed in any preceding claim wherein
the preferred route codes further determine a choice of
a further network (5A,5B,5C) for forward connection
between a network (8A) of the service provider of the
selected communication channel and the call destination
(2) via the further network.

6.   A method as claimed in claim 5 wherein the control
centre collates billing information in respect of
services provided by the service provider and one or more
further service providers of the further networks in
facilitating the making of the call to the call
destination.

7.   A method as claimed in any of claims 5 and 6 wherein
the mobile telephone adds a prefix code (50) to the user
generated call destination information.

8.   A method as claimed in claim 7 wherein the prefix
code includes a customer identification field (52)
containing user specific identification data.

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9.   A method as claimed in any of claims 7 and 8 wherein
the prefix code includes a charging information field
(51) for identifying a control entity (7) to be billed by
one or more service providers corresponding to the
selected network connection route.

10.   A method as claimed in any preceding claim including
the step of the mobile telephone periodically scanning
(62) received transmissions to identify available
communications channels (80,81,82,83) and completing (63)
a registration procedure for all available channels in
order to facilitate subsequent communication by selection
therefrom.

11.   A method as claimed in claim 10 including the step
of electing (64) from the available channels a home
channel (81) for receipt of incoming calls.

12.   A method as claimed in any of claims 10 and 11
including the step of electing (65) from the available
channels an update receiving channel (80) for receipt of
updating information broadcasts.

13.   A method as claimed in any preceding claim wherein
the look-up table (1000) is stored in a portable storage
medium (505) removably installed in the mobile telephone.

14.   A method as claimed in claim 13 wherein the storage
medium is a smart card (505).

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15. A method as claimed in any of claims 13 and 14 wherein the portable storage medium is a SIM (subscriber identity module) card (505) which also stores subscriber specific data for identification and authentication purposes.

16. A method as claimed in any of claims 13 to 15 wherein the look-up table is populated with an initial set of data before installation of the storage medium in the mobile telephone.

17. A method as claimed in any preceding claim including the step of periodically updating the data stored in the look-up table by receiving data blocks each containing a respective portion of updated data and, for each received data block, overwriting a corresponding portion of the existing data with updated data from the received block.

18. A method as claimed in any preceding claim wherein the look-up table (900) comprises:

a routing table (1101) containing the preferred route codes;

a carrier selection table (1102) containing, for each preferred route code, a list in order of priority of carrier selections to be used, subject to availability; and

a carrier access table (1103) containing, for each carrier selection, a channel selection identifying a communications channel provided by a service provider of

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the mobile telephone system and a prefix code to be added
to the dialled number identifying a further network for
routing the call.

5   19.   A method as claimed in claim 18 wherein the look-up
table further comprises a carrier availability table
(1104) containing information indicating which of the
channels are currently available.

10   20.   A method as claimed in claim 19 wherein the step of
accessing the look-up table comprises:
        addressing (1203) the routing table to obtain a
preferred route code;
        using the preferred route code to address (1204) the
15   carrier selection table to obtain a list of carrier
selections;
        addressing (1205) the carrier access table using the
first carrier selection on the list to obtain the prefix
code and channel selection data for the first channel
20   selection; and
        addressing (1206) the carrier availability table
using the channel selection data to determine (1207) if
the first carrier selection is one of the available
channels and, if so, initiating (1208) the call to the
25   call destination using the prefix code via the channel
selection data for the first carrier selection.

        21.   A method as claimed in claim 20 wherein, if the
first carrier selection is determined (1207) not to be an

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available channel, the carrier availability table is
addressed (1210) using channel selection data for a
further carrier selection from the list and, if it is
determined (1207) that the further carrier selection is
an available channel, the call is initiated (1208) using
the prefix code and channel selection data for the
further carrier selection.

22.   A method as claimed in claim 19 wherein the mobile
telephone searches for available communications channels
of the cellular telephone communications system and
updates (66) the carrier availability table accordingly.

23.   A method as claimed in any preceding claim wherein
the look-up table comprises default route data and
wherein if accessing the look-up table with the call
destination information fails to locate corresponding
data defining a preferred route code, the preferred route
code is derived from the default route data.

24.   A method as claimed in any preceding claim wherein
updating information for updating the look-up table is
communicated to the mobile telephone via a selected one
of the available communications channels.

25.   A method as claimed in claim 24 wherein the updating
information is transmitted using an SMS (short message
service) protocol.

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26. A method as claimed in any of claims 24 and 25 wherein the updating information is transmitted as a multipoint broadcast to a plurality of mobile telephones.

27. A method as claimed in any of claims 1 to 26 wherein the updating information is transmitted to the mobile telephone as a web page.

28. A method as claimed in claim 27 wherein the web page is transmitted using Wireless Application Protocol.

29. A method as claimed in any of claims 27 and 28 wherein the mobile telephone processes the web page to extract updating information; stores the extracted updating information in a buffer memory; and updates the look-up table with updating information read from the buffer memory.

30. A method as claimed in any of claims 1 to 23 wherein the updating information is communicated to the mobile telephone by detachably connecting the mobile telephone to a docking station (1300,1500) and transmitting the updating information to the mobile telephone via the docking station.

31. A method as claimed in claim 30 wherein the docking station (1300) is connected to receive a multipoint broadcast of updating information via a broadcast network (1301).

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32.   A method as claimed in claim 31 wherein the docking
station   receives   updating   information   as   signals
multiplexed in a television transmission signal.

33.   A method as claimed in claim 32 wherein the signal
is multiplexed in the vertical blanking interval of the
television transmission signal.

34.   A   method   as   claimed   in   any   of   claims   31   to   33
wherein   the   broadcasting   network   is   an   optical   cable
network (1301).

35.   A   method   as   claimed   in   any   of   claims   31   to   33
wherein   the   broadcasting   network   is   a   satellite
television network.

36.   A method as claimed in claim 30 wherein the docking
station (1500) is connected to a telephone line (1501)
and updating information is received from the control
centre in response to making a telephone call request to
the control centre via the telephone line.

37.   A method as claimed in claim 36 wherein the docking
station (1500) comprises a modem (1600) connected to the
telephone line and which generates the telephone call
request in response to user actuation of the docking
station.

38.   A method as claimed in claim 36 wherein the mobile

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telephone comprises a modem (1600) connected to the telephone line via the docking station and which generates the telephone call request in response to user actuation of the mobile telephone.

39. A method as claimed in any of claims 30 to 38 wherein the mobile telephone comprises an internal battery (1400) which is recharged by detachably connecting the mobile telephone to the docking station.

40. A method as claimed in any preceding claim wherein the preferred route code determines a route via a packet switched network (1800) and comprises network address information defining at least one node (1801) of the network which is to be included in the selected route.

41. A method as claimed in claim 40 wherein the network address information defines at least one further node (1802) of the network which is not to be included in the selected route.

42. A method as claimed in any of claims 40 and 41 wherein the outgoing telephone call is transmitted as a packetised signal using a protocol in which such signals include a start address indicator interpreted by the network as being representative of a network address from which the call originates and comprising the further step of transmitting the outgoing telephone call including start address information (1902) defined by the preferred

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route code.

43.   A method as claimed in claim 42 wherein the start
address information is representative of a start address
which is different from the actual start address of the
outgoing telephone call in the network.

44.   A method as claimed in any preceding claim wherein
    the telephone call is originated to communicate
    data comprising a type of data selected from a set
    of alternative types of data.

45.   A method as claimed in claim 44 wherein the set of
alternative types of data comprises voice data, image
data and data formatted in accordance with an Internet
protocol.

46.   A method as claimed in any of claims 43 and 44
wherein the look-up table stores respective preferred
route codes for each of the types of data.

47.   A method as claimed in any preceding claim wherein
the cellular telephone system comprises part of a packet
switching network in which the mobile telephone
constitutes a node of the network and wherein the call
destination constitutes a further node of the network.

48.   A mobile telephone (1) for use in a cellular
telephone communications system in which a plurality of

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service providers provide respective alternative communications channels (80,81,82,83);

the mobile telephone comprising;

a look-up table (122; 134,135; 900,1000) storing routing information such that the table is populated with data in the form of preferred route codes, each preferred route code being representative of a preferred route for connection to a respective call destination;

input means (130) for originating an outgoing telephone call by the input of user generated call destination information;

accessing means (133) for accessing the look-up table using an address determined at least in part by the call destination information to obtain a selected preferred route code;

channel selecting means (300) for selecting one (83) of the communication channels in accordance with the preferred route code; and

communication means (302,137) for establishing communication for the outgoing telephone call for a call destination corresponding to the call destination information via the selected communication channel of a corresponding selected service provider (4C).

49. A mobile telephone as claimed in claim 48 comprising code generating means (131) operable to add a prefix code (50) to the user generated call destination information.

50. A mobile telephone as claimed in claim 49 wherein

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the prefix code includes a customer identification field
(52) containing user specific identification data.

51.   A mobile telephone as claimed in any of claims 49
and 50 wherein the prefix code includes a charging
information field (51) for identifying a control entity
(7) to be billed by one or more service providers
corresponding to the selected network connection route.

52.   A mobile telephone as claimed in any of claims 48 to
51 comprising means (300) for periodically scanning
received   transmissions   to   identify   available
communications channels (80,81,82,83) and completing a
registration procedure for all available channels in
order to facilitate subsequent communication by selection
therefrom.

53.   A mobile telephone as claimed in claim 52 including
electing means for electing from the available channels
a home channel (81) for receipt of incoming calls.

54.   A mobile telephone as claimed in claim 53 wherein
the electing means is further operable to elect from the
available channels an update receiving channel (80) for
receipt of updating information broadcasts.

55.   A mobile telephone as claimed in any of claims 48 to
54 wherein the look-up table (1000) is stored in a
portable storage medium (505) removably installed in the

mobile telephone.

56. A mobile telephone as claimed in claim 55 wherein the storage medium is a smart card (505).

57. A mobile telephone as claimed in any of claims 55 and 56 wherein the portable storage medium is a SIM (subscriber identity module) card (505) which also stores subscriber specific data for identification and authentication purposes.

58. A mobile telephone as claimed in any of claims 48 to 57 comprising updating means (901,136) for periodically updating the data stored in the look-up table by receiving data blocks each containing a respective portion of updated data and, for each received data block, overwriting a corresponding portion of the existing data with updated data from the received block.

59. A mobile telephone as claimed in any of claims 48 to 58 wherein the look-up table (900) comprises:

a routing table (1101) containing the preferred route codes;

a carrier selection table (1102) containing, for each preferred route code, a list in order of priority of carrier selections to be used, subject to availability; and

a carrier access table (1103) containing, for each carrier selection, a channel selection identifying a

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communications channel provided by a service provider of the mobile telephone system and a prefix code to be added to the dialled number identifying a further network for routing the call.

60. A mobile telephone as claimed in claim 59 wherein the look-up table further comprises a carrier availability table (1104) containing information indicating which of the channels are currently available.

61. A mobile telephone as claimed in claim 60 wherein the accessing means comprises:

    means (500) for addressing the routing table to obtain a preferred route code;

    means (500) for using the preferred route code to address the carrier selection table to obtain a list of carrier selections;

    means (500) for addressing the carrier access table using the first carrier selection on the list to obtain the prefix code and channel selection data for the first channel selection; and

    means (500) for addressing the carrier availability table using the channel selection data to determine (1207) if the first carrier selection is one of the available channels and, if so, initiating (1208) the call to the call destination using the prefix code via the channel selection data for the first carrier selection.

62. A mobile telephone as claimed in claim 61 wherein,

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if the first carrier selection is determined (1207) not
to be an available channel, the means for addressing the
carrier availability table is operable to address the
table using channel selection data for a further carrier

5   selection from the list and, if it is determined that the
further carrier selection is an available channel, to
initiate the call using the prefix code and channel
selection data for the further carrier selection.

63.   A mobile telephone as claimed in claim 60 comprising

10   means (300) for searching for available communications
channels of the cellular telephone communications system
and means (136) for updating the carrier availability
table accordingly.

64.   A mobile telephone as claimed in any preceding claim

15   wherein the look-up table comprises default route data
(1105) and wherein the accessing means is operable, if
accessing the look-up table with the call destination

20   information fails to locate corresponding data defining
a preferred route code, to derive preferred route code
from the default route data.

65.   A mobile telephone as claimed in any of claims 48 to

25   64 comprising means (901) for extracting updating
information for updating the look-up table from signals
communicated to the mobile telephone via a selected one
of the available communications channels.

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66.   A mobile telephone as claimed in claim 65 wherein the updating information is extracted from signals encoded using an SMS (short message service) protocol.

5   67.   A mobile telephone as claimed in claim 66 wherein the extracting means (500) is operable to extract the updating information from data transmitted to the mobile telephone as a web page.

10   68.   A mobile telephone as claimed in claim 67 wherein the extracting means extracts updating information from the web page using Wireless Application Protocol.

69.   A mobile telephone as claimed in any of claims 67
15   and 68 wherein the extracting means comprises a processor operable to process the web page to extract updating information; store the extracted updating information in a buffer memory (902); and update the look-up table with updating information read from the buffer memory.

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70.   A mobile telephone as claimed in any of claims 48 to 64 comprising connecting means (1302) operable to detachably connect the mobile telephone to a docking station (1300,1500) and an interface (1406) for receiving
25   the updating information transmitted in use to the mobile telephone via the docking station.

71.   A mobile telephone as claimed in claim 70 co-operable in use with a docking station (1500) connected

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to a telephone line (1501) such that updating information
is received from the control centre in response to making
a telephone call request to the control centre via the
telephone line; wherein the mobile telephone comprises a
modem (1600) connectable in use to the telephone line via
the docking station and which modem is operable to
generate the telephone call request in response to user
actuation of the mobile telephone.

72. A mobile telephone as claimed in any of claims 48 to
71 wherein the preferred route code determines a route
via a packet switched network (1800) and comprises
network address information defining in use at least one
node (1801) of the network which is to be included in the
selected route.

73. A mobile telephone as claimed in claim 72 wherein
the network address information defines in use at least
one further node (1802) of the network which is not to be
included in the selected route.

74. A mobile telephone as claimed in any of claims 72
and 73 comprising means for transmitting the outgoing
telephone call as a packetised signal using a protocol in
which such signals include a start address indicator
interpreted in use by the network as being representative
of a network address from which the call originates and
wherein the transmitting means is operable to transmit
the outgoing telephone call including start address

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information (1902) defined by the preferred route code.

75. A mobile telephone as claimed in any of claims 48 to 74 and operable to output communications signals representative of a type of data selected from a set of alternative types of data.

76. A mobile telephone as claimed in claim 75 wherein the types of data comprise voice data, image data and data formatted in accordance with an Internet protocol.

77. A mobile telephone as claimed in any of claims 75 and 76 wherein the look-table stores respective preferred route codes for each of the types of data.

78. A docking station for use with a mobile telephone having a look-up table for routing information, the docking station comprising connecting means for detachably connecting the mobile telephone to the docking station and an interface (1405) for transmitting updating information in use to the mobile telephone for updating the look-up table.

79. A docking station as claimed in claim 78 operable to receive a broadcast of updating information via a broadcast network and comprising a decoder (1401) for decoding signals multiplexed in the vertical blanking interval of a television transmission signal.

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80.   A docking station as claimed in claim 78 having means for receiving updating information via a telephone line (1501).

81.   A docking station as claimed in claim 80 comprising a modem (1600).

82.   A docking station as claimed in claim 81 comprising means (1700) for initiating the generation of a telephone call via the telephone line requesting the transmission of updating information.

83.   A portable storage medium for use in a mobile telephone, the storage medium storing a look-up table (1000) populated with data in the form of preferred route codes, each preferred route code being representative of a preferred route for connection to a respective call destination.

84.   A portable storage medium as claimed in claim 83 comprising a smart card (505).

85.   A   computer   program   comprising   processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in any of claims 1 to 47.

86.   A storage medium storing processor implementable instructions for carrying out a method of operating a

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mobile telephone as claimed in any of claims 1 to 47.

87. A communications signal comprising processor implementable instructions for carrying out a method of operating a mobile telephone as claimed in any of claims 1 to 47.

88. A communications signal comprising route selecting information contained in an outgoing telephone call signal in accordance with a method as claimed in any of claims 1 to 47.

89. A method of routing a telephone call comprising adding a prefix code to a user generated call information such that the prefix code defines a preferred route via a packet switching network, wherein the prefix code comprises a string of network node addresses.
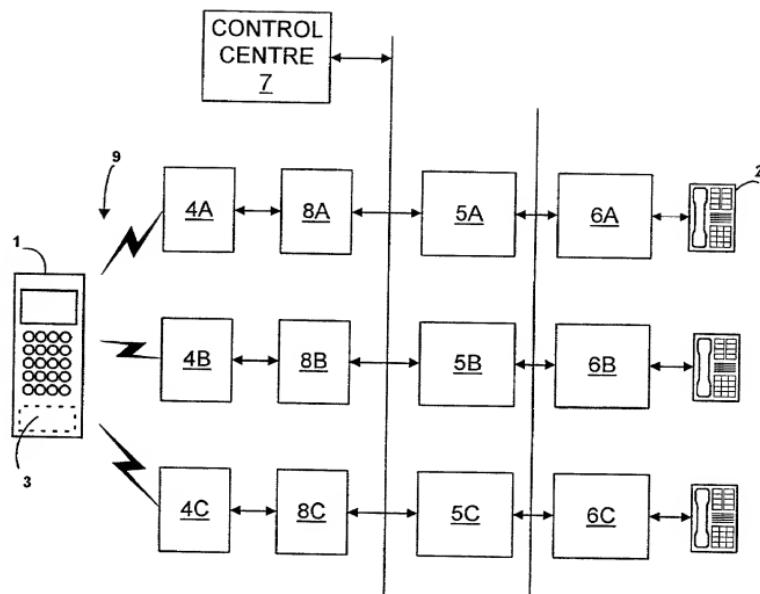
Fig 1

Fig 2

Fig 3

Fig 4

1	NETWORK REF	CONTROL REF	CUSTOMER REF	DIALLED NUMBER

50 51 52 53

Fig 5

Fig 6

Fig 7

INITIATING AN OUTGOING CALL

USER DIALS NUMBER	70

↓

PROCESSOR ACCESSES PREFERED ROUTE INFORMATION	71

↓

SET COMMUNICATION CHANNEL	72

↓

ADD PREFIX CODE	73

↓
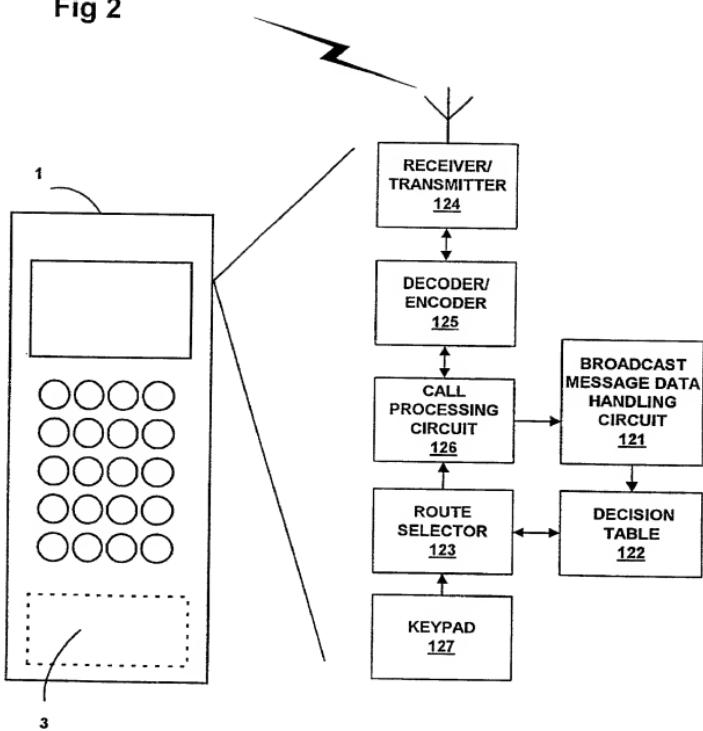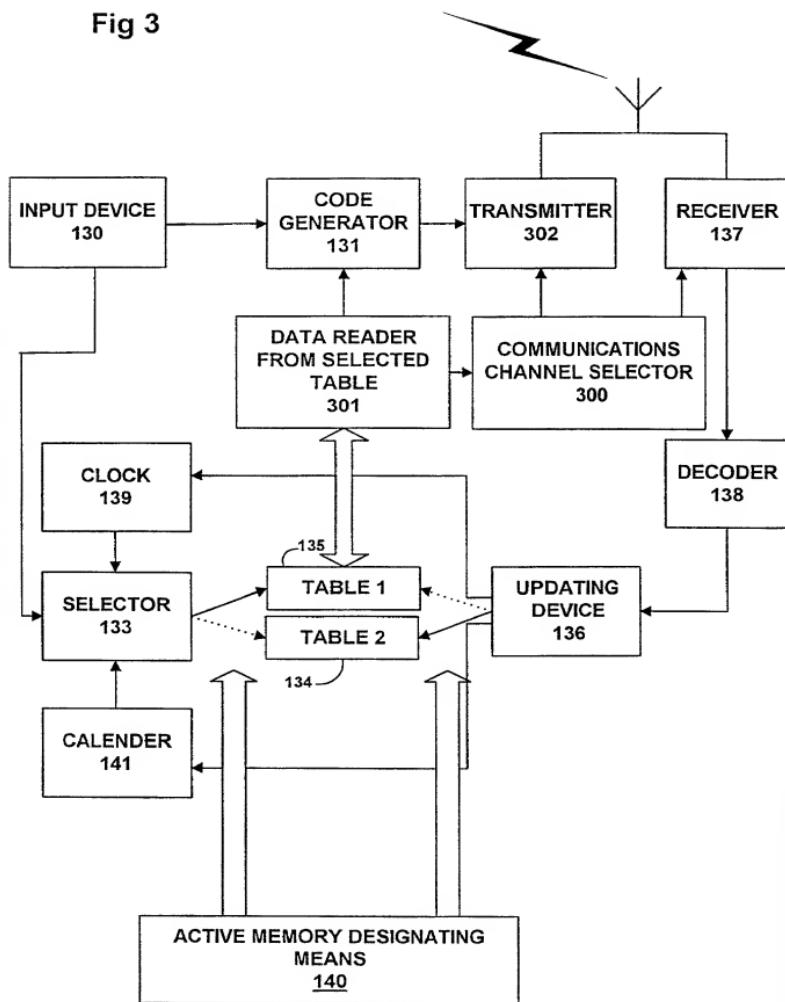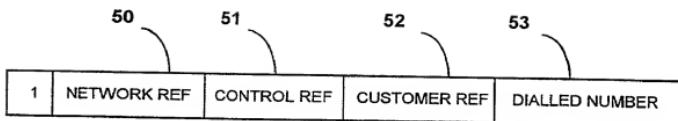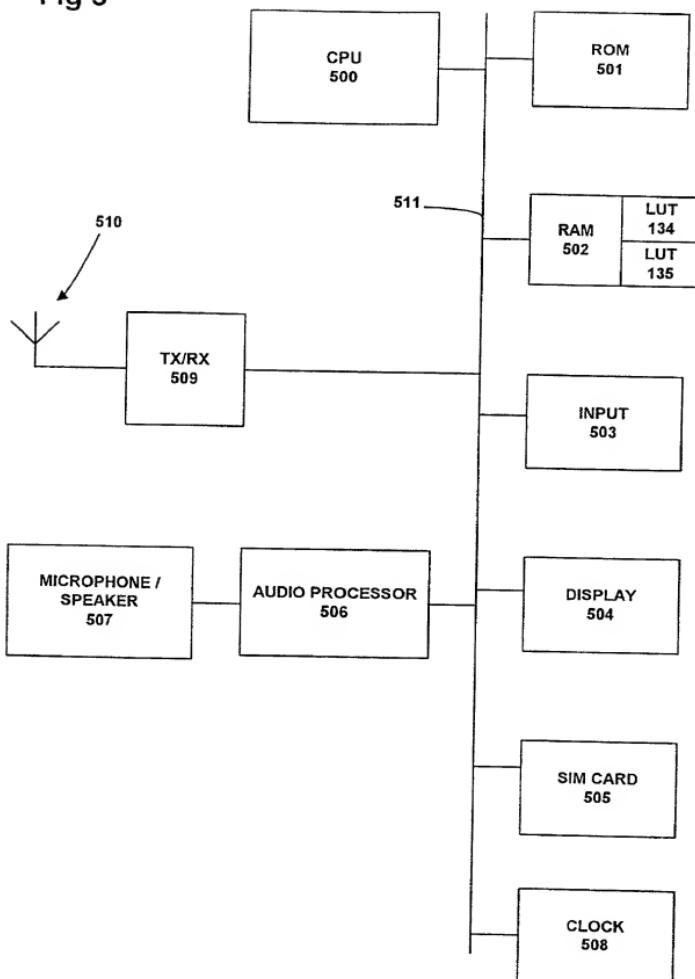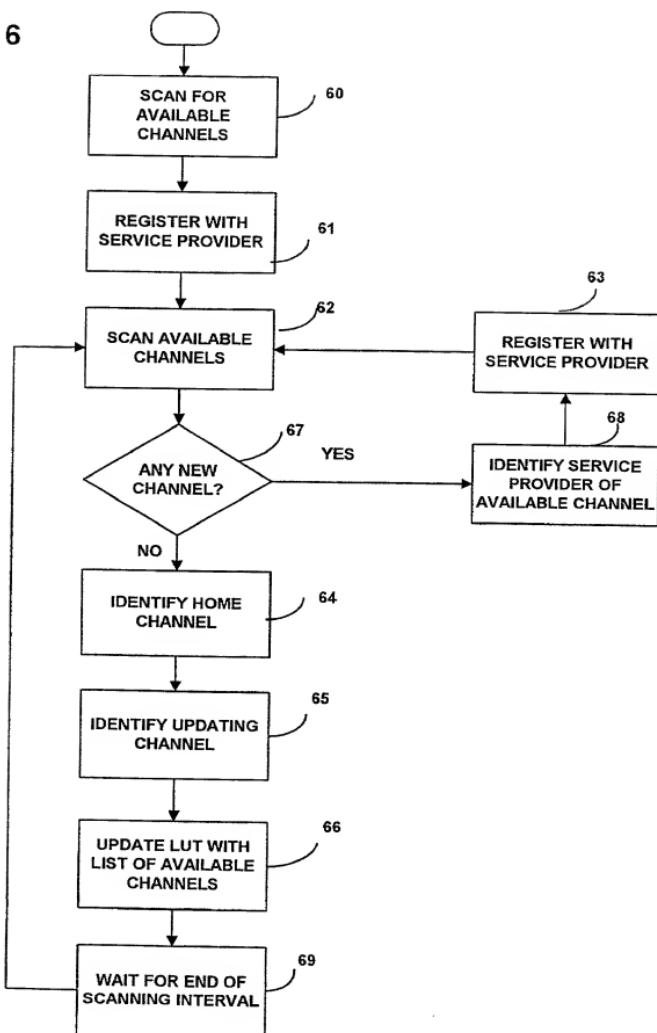
INITIATE OUTGOING CALL	74
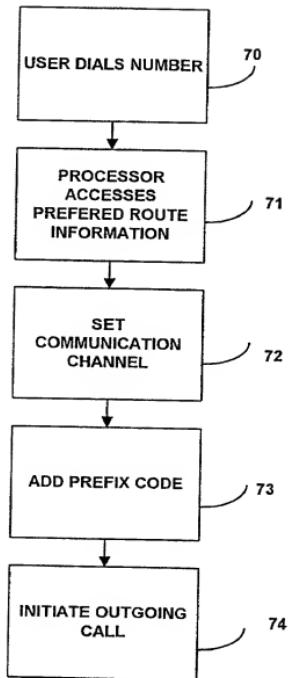
Fig 8
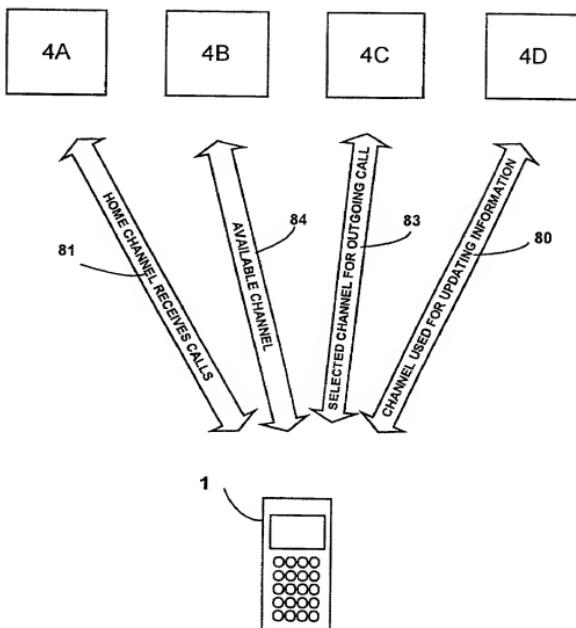
MOBILE TELEPHONE WITH SINGLE LUT

Fig 9
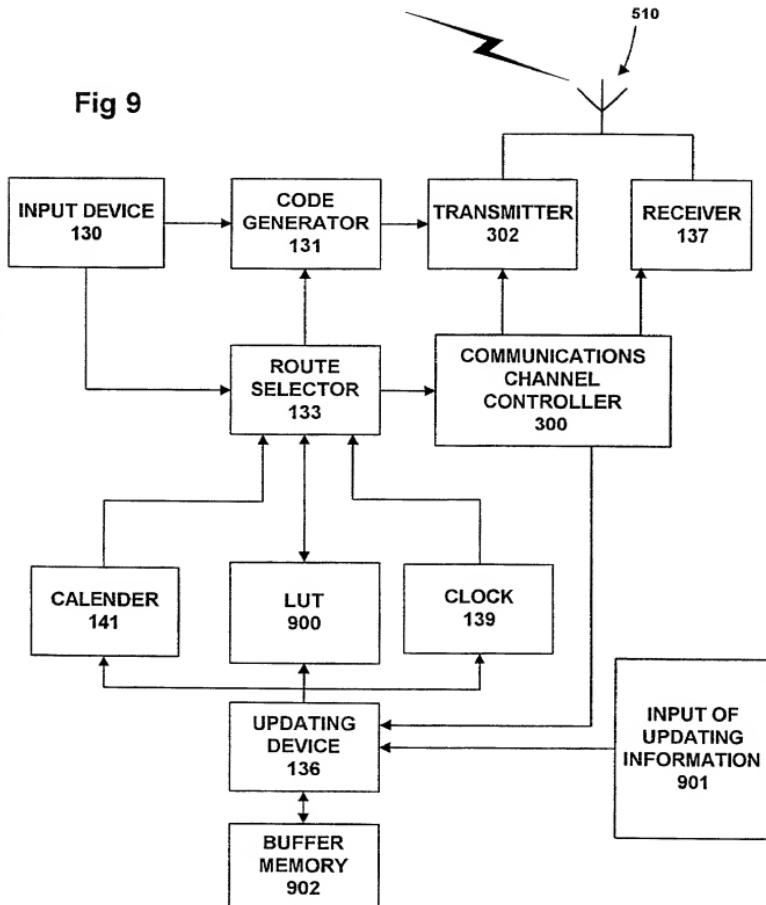
MOBILE TELEPHONE WITH ROUTING LUT IN SIM CARD

Fig 10

STRUCTURE OF LUT

Fig 11

900

EXCLUSION TABLE
1100

ROUTING TABLE
1101

CARRIER SELECTION
TABLE
1102

CARRIER ACCESS
TABLE
1103

CARRIER
AVAILABILITY TABLE
1104

DEFAULT ROUTE
DATA
1105

NETWORK STATUS
DATA
1106

Fig 12

1200 ADDRESS EXCLUSION TABLE

1201 IS DESTINATION EXCLUDED? — Y

N

1203 ADDRESS ROUTING TABLE TO LOOK UP PREFERRED ROUTE CODE

1204 ADDRESS CARRIER SELECTION TABLE WITH PREFERRED ROUTE CODE, CALL CHARACTERISTIC DATA AND LOOK UP PRIORITY LIST OF CARRIER SELECTIONS, IN ORDER OF PREFERENCE, SUBJECT TO AVAILABILITY

1205 ADDRESS THE CARRIER ACCESS TABLE WITH HIGHEST PRIORITY CARRIER SELECTION IN LIST TO OBTAIN PREFIX CODE AND CHANNEL SELECTION DATA

1206 ACCESS CARRIER AVAILABILITY TABLE

1210 ADDRESS CARRIER ACCESS TABLE WITH NEXT HIGHEST PRIORITY CARRIER SELECTION IN LIST TO OBTAIN PREFIX CODE AND CHANNEL SELECTION DATA

1207 CHANNEL AVAILABLE — N

1209 ANY MORE CARRIERS ON LIST — Y

N

Y

1208 MAKE CALL USING SELECTED PREFIX CODE AND VIA CHANNEL DEFINED BY CHANNEL SELECTION DATA

1202 MAKE CALL USING DEFAULT SETTING

Fig 13

MOBILE PHONE WITH DOCKING STATION

Fig 14   MOBILE PHONE WITH DOCKING STATION FOR
CABLE NETWORK UPDATING OF LUT
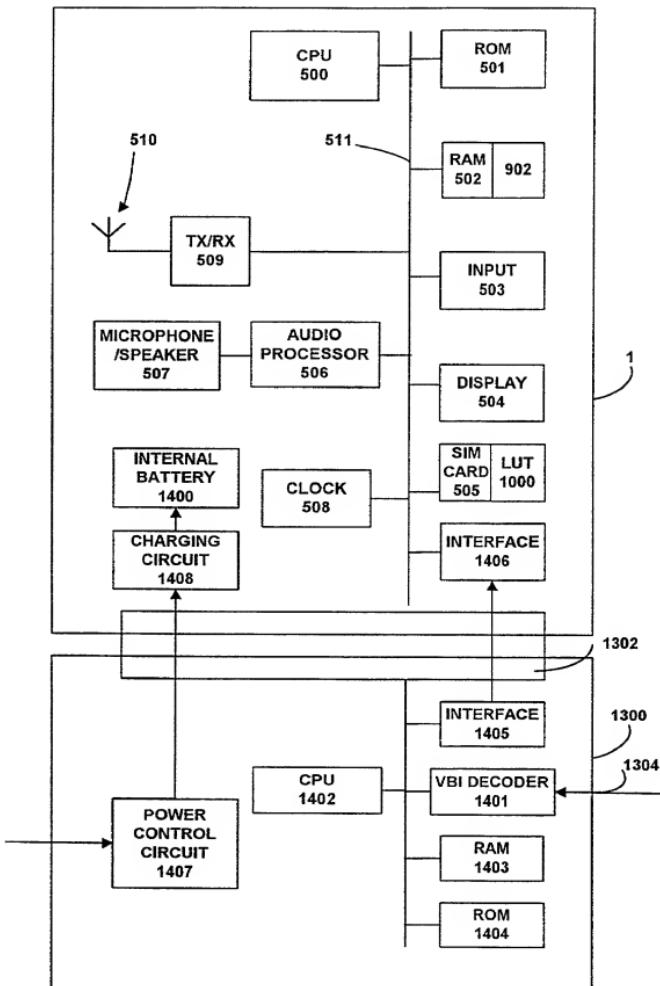
Fig 15

MOBILE PHONE WITH DOCKING STATION FOR
LAND LINE TELEPHONE UPDATING OF LUT

09/869295
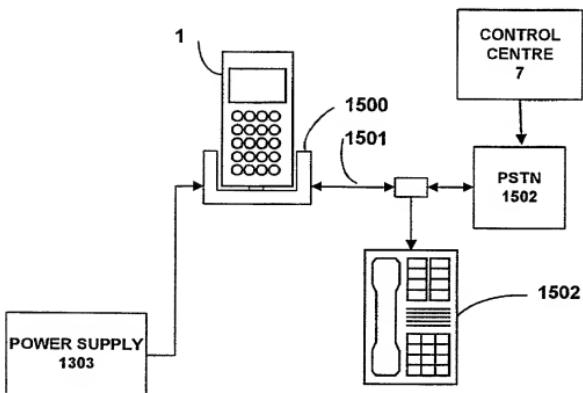
Fig 16

MOBILE PHONE WITH DOCKING STATION FOR
LAND LINE TELEPHONE UPDATING
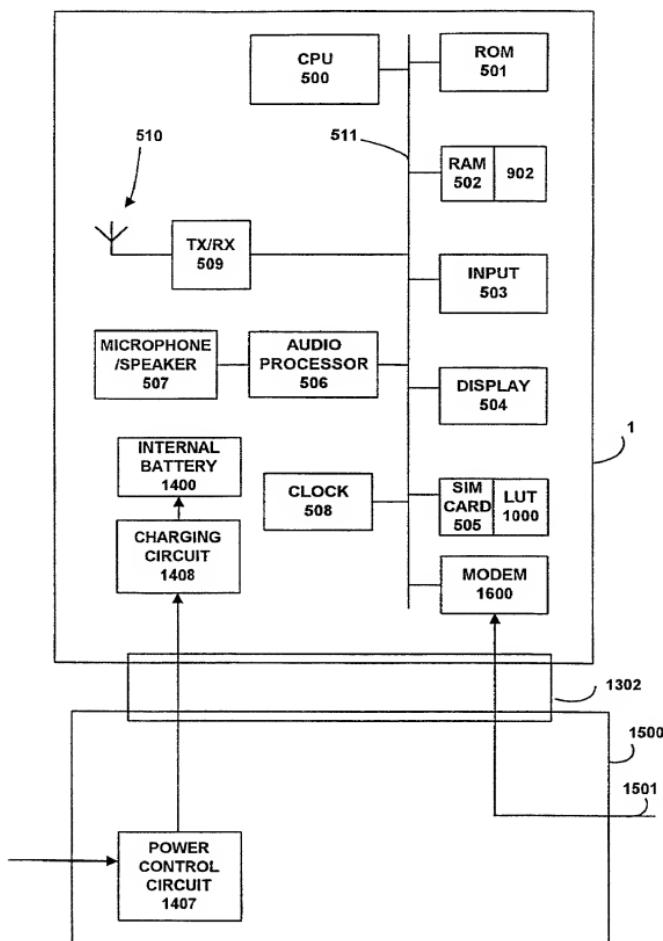
Fig 17

**MOBILE PHONE WITH DOCKING STATION HAVING A MODEM
FOR LAND LINE TELEPHONE UPDATING OF LUT**

Fig 18

ROUTING VIA PACKET SWITCHED
NETWORK
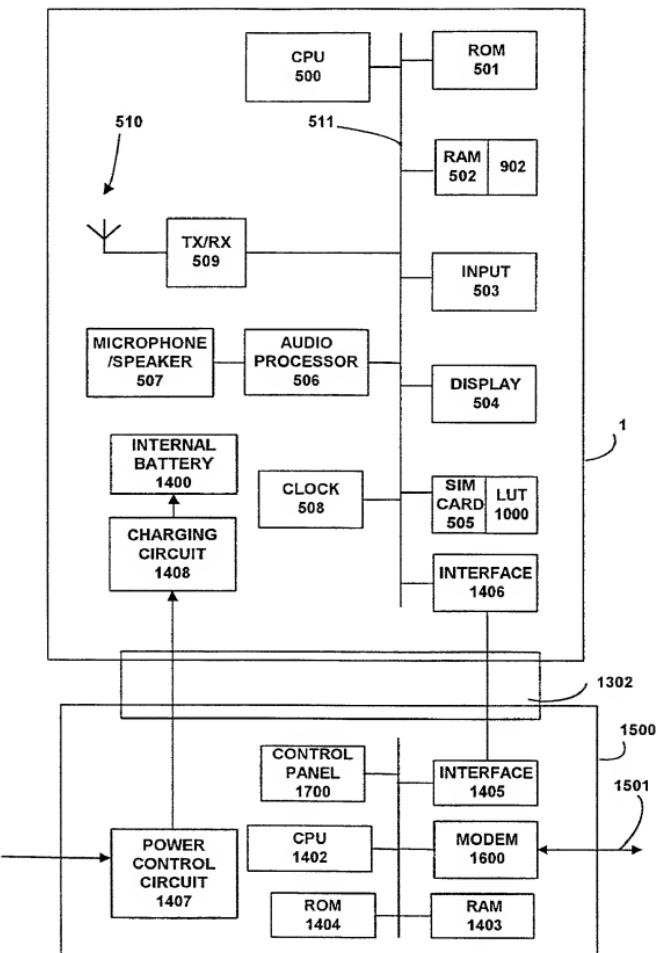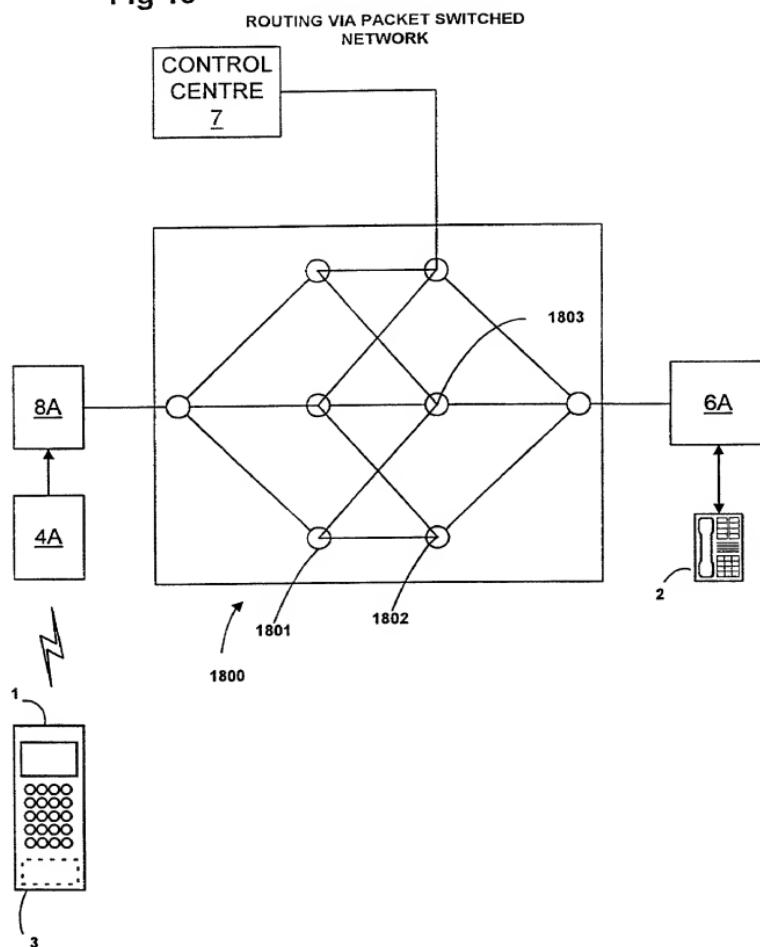
Fig 19

PREFIX CODE FOR ROUTING VIA PACKET
SWITCHED NETWORK

HEADER CODE	STRING OF NETWORK ADDRESS CODES	SOURCE ADDRESS INFORMATION	CONTROL REF	DIALLED NUMBER
1900	1901	1902	1903	1904
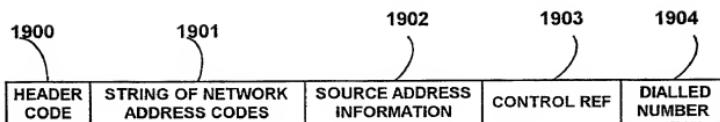
ROUTING VIA INTERNET AND UPDATING
LUT VIA WEB PAGES
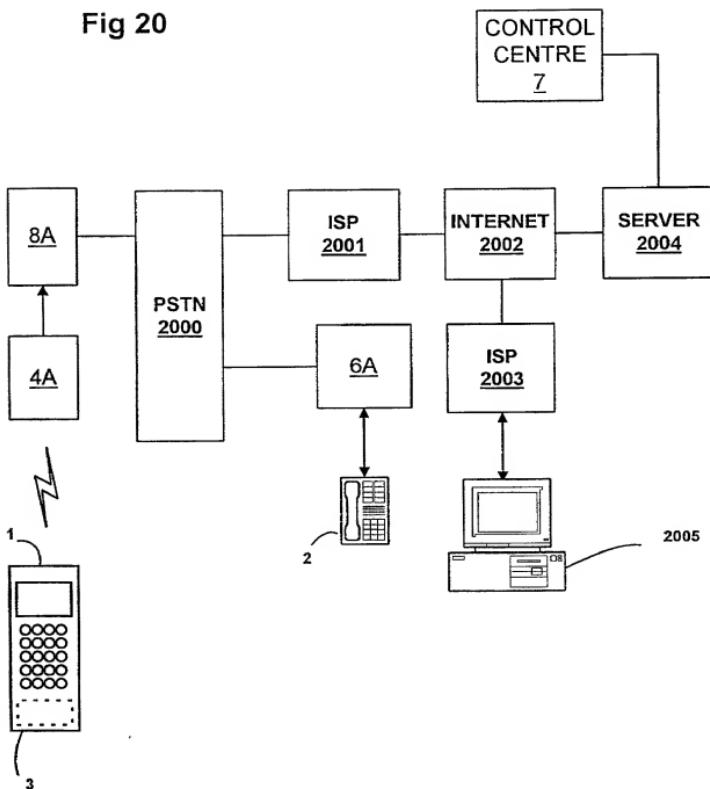
Fig 20

ROUTING VIA INTEGRATED PACKET
SWITCHED NETWORK

Fig 21
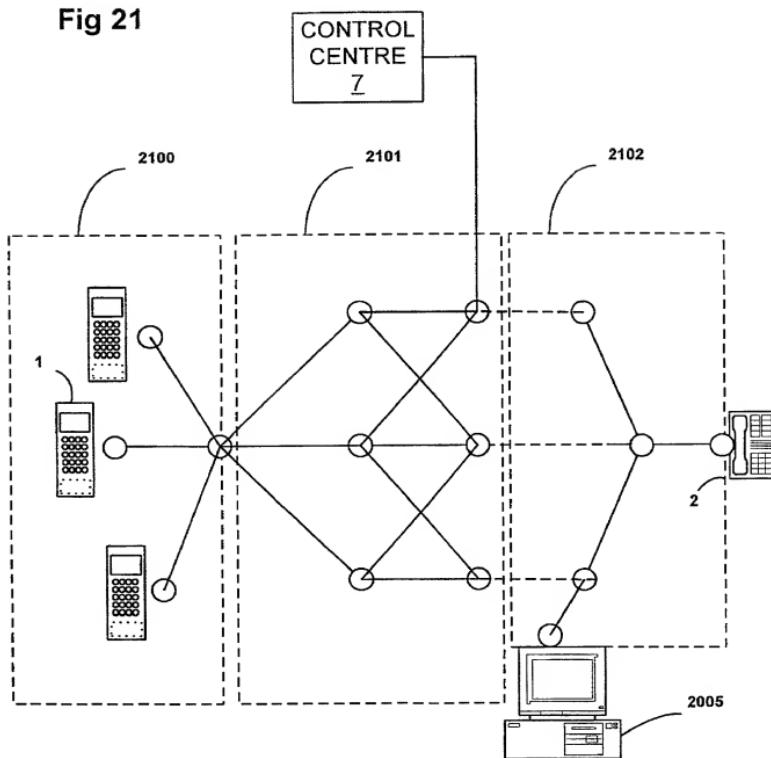
Fig 22

𝔇eclaration, 𝔓ower 𝔒f 𝔄ttorney and 𝔓etition
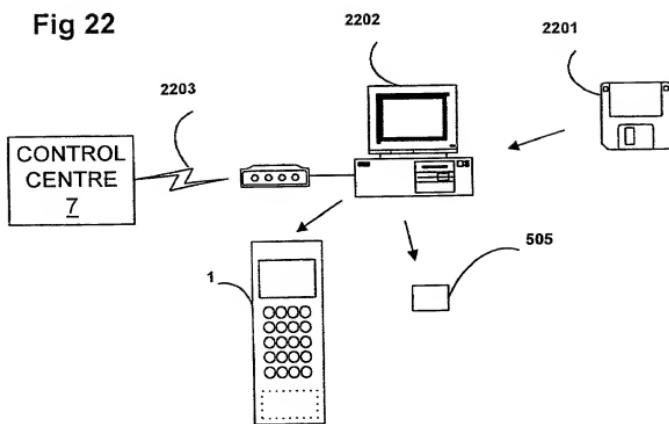
WE (I) the undersigned inventor(s), hereby declare(s) that:

My residence, post office address and citizenship are as stated below next to my name,

We (I) believe that we are (I am) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

APPARATUS AND METHOD FOR ROUTING COMMUNICATIONS

the specification of which

    ☐ is attached hereto.

    ☐ was filed on _____ as

       Application Serial No. _____

       and amended on _____ .

    ☒ was filed as PCT international application

    Number ___PCT/GB00/00114_____

    on _____18 January 2000_____ ,

    and was amended under PCT Article 19

    on _____ (if applicable).

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed. Prior Foreign Application(s)

Application No.	Country	Day/Month/Year	Priority Claimed	
9901036.5	GB	18 JAN 1999	☒ Yes	☐ No
			☐ Yes	☐ No
			☐ Yes	☐ No
			☐ Yes	☐ No

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We (I) hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

_____   _____
(Application Number)   (Filing Date)

_____   _____
(Application Number)   (Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application Serial No.	Filing Date	Status (pending, patented, abandoned)
_____	_____	_____
_____	_____	_____
_____	_____	_____

And we (I) hereby appoint: Norman F. Oblon, Reg. No. 24,618; Marvin J. Spivak, Reg. No. 24,913; C. Irvin McClelland, Reg. No. 21,124; Gregory J. Maier, Reg. No. 25,599; Arthur I. Neustadt, Reg. No. 24,854; Richard D. Kelly, Reg. No. 27,757; James D. Hamilton, Reg. No. 28,421; Eckhard H. Kuesters, Reg. No. 28,870; Robert T. Pous, Reg. No. 29,099; Charles L. Gholz, Reg. No. 26,395; William E. Beaumont, Reg. No. 30,996; Jean-Paul Lavalleye, Reg. No. 31,451; Stephen G. Baxter, Reg. No. 32,884; Richard L. Treanor, Reg. No. 36,379; Steven P. Weihrouch, Reg. No. 32,829; John T. Goolkasian, Reg. No. 26,142; Richard L. Chinn, Reg. No. 34,305; Steven E. Lipman, Reg. No. 30,011; Carl E. Schlier, Reg. No. 34,426; James J. Kulbaski, Reg. No. 34,648; Richard A. Neifeld, Reg. No. 35,299; J. Derek Mason, Reg. No. 35,270; Surinder Sachar, Reg. No. 34,423; Christina M. Gadiano, Reg. No. 37,628; Jeffrey B. McIntyre, Reg. No. 36,867; William T. Enos, Reg. No. 33,128; Michael E. McCabe, Jr., Reg. No. 37,182; Bradley D. Lytle, Reg. No. 40,073; and Michael R. Casey, Reg. No. 40,294; our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to the firm of OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, P.C., whose Post Office Address is: Fourth Floor, 1755 Jefferson Davis Highway, Arlington, Virginia 22202.

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

DE BEER; Leon
NAME OF FIRST SOLE INVENTOR

Signature of Inventor

4 July 2001
Date

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Post Office Address: _____

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